OCTOBER, 1955

INDUSTRY & WELDING

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AND IMPORTANT STATEMENTS BY

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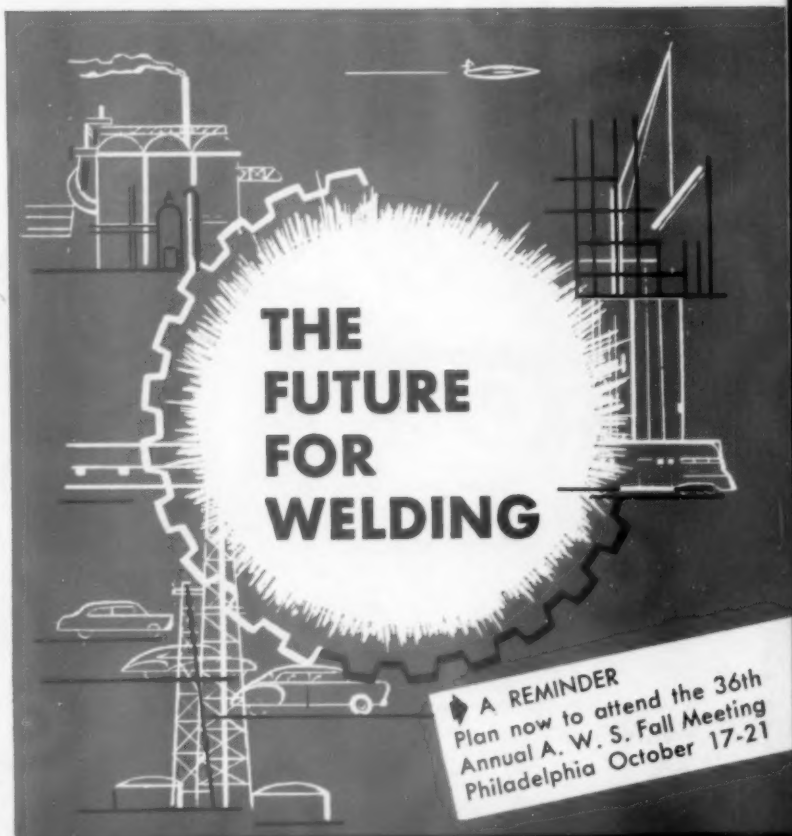
J. C. Wilson, Jr., President, R.W.M.A.



STARTING ON PAGE 51 . . . one of the most interesting and thought-provoking series of articles ever presented to the welding industry. Written by outstanding welding authorities from some of the country's most important industries, these articles may set the pattern for the future of welding in our expanding economy.

New SUPERGOGGLES by Jackson

They're *wider* to allow plenty of inside room for good fit and free up and down movement where today's larger (never wider than 5 11/16") prescription and safety spectacles are worn.

They're also *deeper*, to clear the bridge of "horn-rimmed" glasses, somewhat deeper along the temples to afford greater side protection to the eyes, without being bulky.

This width and depth, added only where needed, gives an 18% greater, well ventilated inside area, making the Supergoggles also more comfortable, cooler to wear.

Eye cups are of strong plastic, non-conductive, non-irritating. A large, screen covered vent in each cup prevents fogging. Cups are joined by a metal bar, flexible enough to fit the goggles individually, rigid enough for one-hand positioning. A large leather pad closes in softly around the nose. Lenses, held by threaded plastic retaining rings, are replaced without tools.

Series '70'

For Gas Welding, Flame Cutting & Brazing, types W-70 and WR-70 have 50 mm. lenses, shades 3 thru 6. Baffle plates over vent screens exclude light, flying particles.

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Elastic Headband holds WR-70, GR-70.

Plastic Headrest holds types W-70 and G-70 more firmly. Extruded plastic, impregnable to moisture, holds its shape, is easy to sterilize. Positive locking adjustment has clearly marked hat sizes. Cork-padded sweatband is easy, inexpensive to replace. Adjustable springs, in telescopic arms, hold goggles gently against face.

Series '50' Goggles fit over narrow-frame prescription glasses and safety spectacles

Series '60' Unigoggles fit over the widest prescription and safety glasses now in use

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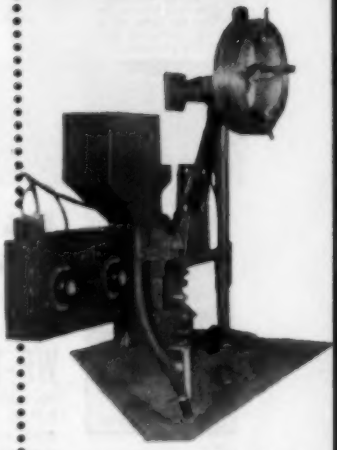

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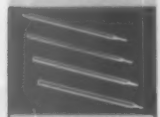

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Industry & Welding

OCTOBER, 1955

VOL. 28 No. 10

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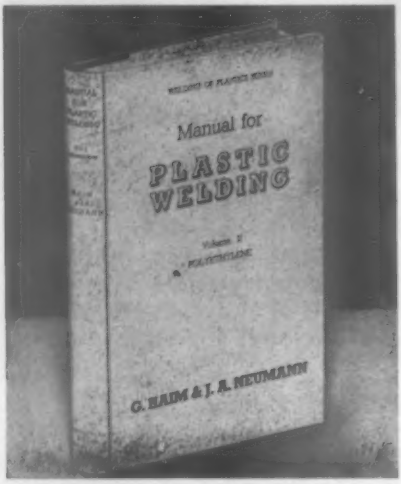
PLASTIC WELDING



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Weldit, Inc. proudly introduces their new L-P "Heat-erama" Salamander, Model #900. Designed to give maximum high heat output at low cost, it features the famous "Flame Dome" for 360 degree heat distribution and 100% automatic safety shut-off. Floor Type Model #800 and Tank Top Model #1850 also available.

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NEW K-G "on guard" REGULATORS

are protected against rough handling

K-G "On Guard" Regulators are tough. They can "take it" and stay on the job, instead of the shelf. They provide improved economy, safety and performance, practically eliminating regulator repairs—internal and external.

Long Life — Less Repairs — Less Cost!

Features *Exclusive* with K-G:

1. Patented *gauge guard*, with positive spring lock action.
2. Stainless steel inlet nipple strong enough to endure impact resulting from accidental cylinder upset.
3. Stainless steel internal adjusting screw of an exclusive, completely new and rugged design.
4. Smooth, easy pressure adjustment developed by a fully enclosed thrust-bearing—part of the adjusting mechanism.
5. Strong stainless steel in all internal parts.
6. Body and bonnet forgings of a new aluminum alloy of great strength and corrosion resistance.
7. A new sintered stainless steel Filter Pressure Check Unit, precludes the basic causes of regulator failure, exclusive with K-G.

K-G Gauge Guard Regulators are available in both single and two-stage models for most compressed gases. Send for new bulletin giving detailed information.

The K-G Equipment Company (Inc.)

A Unit of Air Products, Inc.

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ALUMINUM WELDING CABLE

. . . for very light weight, flexibility and ease of handling

Welder's delight – General Cable's new TYPE D-866 Welding Cable with aluminum conductor is lighter and far easier to handle than copper welding cable! Rope-like construction of its annealed aluminum conductor promotes an extraordinary degree of flexibility, prevents kinking. Flexibility is further increased by use of a special separator tape. Result: unequaled freedom of wrist movement—ease of equipment handling.

The overlapping separator tape also provides excellent stripping properties. Combined insulation and jacket of tough vulcanized rubber assures outstanding resistance to abrasion, impact, flexing and twisting. Type D-866 Wedling Cable offers an economical construction and provides all the essential properties necessary for safety and long service life on the great majority of applications.

When both quality and economy are important . . . look to General Cable for *all* your electrical wire and cable needs!

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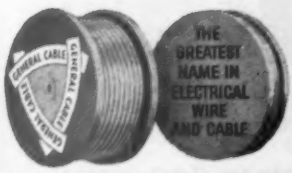

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of the WELDING INDUSTRY

Alloy Rods Opens New Research Lab

E. J. Brady, president of Alloy Rods Co., has announced formal opening of the company's new research and development center. Devoted exclusively to product research and quality control, new structure is located adjacent to the company's general offices in York, Penna.

Walsh Is Sales Engineer for General Ceramics Corp.

John P. Walsh, formerly with Foster Wheeler Corp., has been appointed Sales Engineer for General Ceramics' Pyrotone Welding Backing Rings. In his new capacity in the firm's Chemical Equipment Division, Mr. Walsh will handle sales and service of Pyrotone Rings. He was formerly welding inspector and engineer for Foster Wheeler.

Thermacote Subsidiary of Holiday Plastics

Thermacote Welding Products, Inc., and Thermacote Mfg. Company announce they have become a wholly owned subsidiary of Holiday Plastics, Inc., Kansas City, Mo. George K. Frischer is new president of overall operation, with Robert Vaillancourt remaining president of Thermacote Division, and Richard Vaillancourt continuing as vice president in charge of sales. C. W. Niederauer remains as General Manager of Thermacote Division.

Progressive Names Ronald L. Loup

Progressive Welder Sales Co. has appointed Ronald L. Loup as Director of its Development Engineering Division. A graduate of General Motors Institute, Mr. Loup has a wide background in engineering and process development.

More News on Page 12

RENFROE

THE *Finest* IN
Lifting and
Positioning
Clamps

Safety Snap Lock

CLAMPS

The gripping cam is actuated by pull on the lifting shackle. This increases gripping power as load becomes greater. Manual operation of locking lever causes clamp to *snap lock* on plate or assembly and *snap open* for easy removal.

- THE ONLY CLAMP WITH A SAFETY LOCK
- MAXIMUM SPEED AND SAFETY
- LOCK ON IN ANY POSITION
- LOCK OFF IN ANY POSITION
- CANNOT BE ACCIDENTALLY KNOCKED OFF
- TAKES THE PLACE OF WELDED PAD EYES AND SCREW CLAMPS
- EXCEPTIONALLY LIGHT IN WEIGHT
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- THE TOUGHEST CLAMP EVER BUILT
- MADE OF FINEST GRADE TOOL STEEL

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Bridges Heads Purchasing at R and R Welding

Appointment of Ivan M. Bridges as Assistant Manager in charge of purchasing and inventory control, has been announced by C. S. Rutherford, president of R and R Welding Supply Co., Des Moines, Iowa.

During the last two years, Mr. Bridges was a manufacturers' agent. Prior to that he was with C. E. Erickson Co. of Des Moines, where he was in charge of purchasing and performed other executive functions. He is an active member of several industrial and trade associations.

Sciaky Opens Two Sales Offices

Two new sales and service offices opened by Sciaky Bros., Inc., are located at 231 Healy Building, Atlanta 3, Georgia, and 709 Bank of American Building, San Diego, Calif.

Newton Co. Represents World Electric

Appointment of Robert H. Newton Co. as District Representatives has been announced by World Electric Co., designers and builders of standard and special automatic welding equipment. Robert H. Newton, founder of the firm, is assisted by William Harper, Jr., and Harry V. Stanton. All have had wide background in sales engineering and executive positions.

More News on Page 14

THE CUTTING SENSATION

New BURDOX BEAVER

portable cutting machine cuts easier . . . cleaner . . . better . . . at less cost!

FOR STRAIGHT LINE, BEVEL CIRCLE AND SHAPE CUTTING. CUTS UP TO 4" WITH EASE.

• Weighs only 16 pounds but cuts better than machines twice its size and weight. Handles like a dream. Cuts metal from ⅛" to 4" in thickness. Costs less to own . . . costs less to use — makes other types of machines obsolete by comparison. Write for details today.

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Reduce your downtime, cut your costs

. . . *with* AMPCO-WELD* *resistance-welding products*

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AMPCO-WELD seam welding wheels — "off-the-shelf" shipment of rough forgings or finished blanks. Rapid delivery of wheels machined to your specifications.

AMPCO-WELD spot-welding tips — available in all standard-straight and cold-bent types for immediate delivery.

AMPCO-WELD bar and rod — shipment of round, hex, square, or rectangular bars of standard sizes without delay.

AMPCO-WELD holders — delivery from stock of straight, offset, or universal ejector types. Offset and universal holders have interchangeable sockets for No. 1 and 2 tapers.

Don't put up with downtime — order AMPCO-WELD products today. They always meet or exceed RWMA specifications. Contact your local AMPCO-WELD Distributor or write us for latest literature. RW-17A

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West Coast Plant: BURBANK, CALIFORNIA

*Reg. U. S. Pat. Off.

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New All-State Regional Manager

John H. Poulson, Ogunquit, Maine, has been appointed Regional Manager for All-State Welding Alloys Co., Inc., to cover the New England states and eastern New York, exclusive of metropolitan area. Announcement was made by T. D. Nast, president, at the company's White Plains offices.

Mr. Poulson has a wide background in welding. A member of the American Welding Society, he has spoken at many AWS meetings.

Middlestead Company Expands Sales Coverage

C. W. Middlestead, president ot Middlestead Company recently announced the opening of an office in Baltimore, Maryland. R. W. Crawford is in charge. The appointment of John Jenzano to the sales engineering staff at company's Upper Darby, Pa., home office has also been announced.

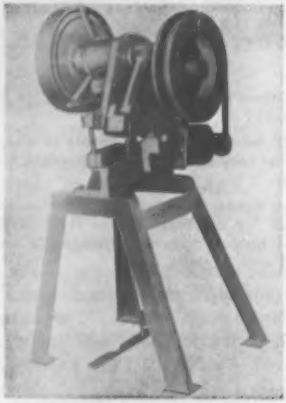
American Wheelabrator Announces Name Change

American Wheelabrator and Equipment Corp., Mishawaka, Indiana, has announced the change of its corporate name to Wheelabrator Corp.

More News on Page 148

BATEMAN POWER SHEAR

IDEAL FOR THE USERS OF SMALL ANGLES OR FLATS



- No grinding necessary after cut.
- Cuts angles up to 2" x 2" x ¼" and flats up to ⅛" x 4".
- Flywheel with a gear drive for power with a small motor.
- A one stroke cycle clutch operated by either hand or foot.
- With clutch open, will make 44 strokes per minute.
- Made of high grade cast iron, hardened clutch and clutch pin, shear steel blades.
- From floor to top of machine—56" with stand. Floor to shear blade—36". Floor space required—24" x 27".
- With notched blade—will cut up to ¾" rounds, or ⅝" reinforcing rod.
- Special blade and punch for ornamental iron work.

¾ HP. motor required for power. We furnish 2-groove motor pulley and 2 belts when ordered without motor. Shipping wt. approx. 485 lbs., without stand. With stand, 560 lbs.

WITH MOTOR AND STAND **$450.00**

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MINERAL WELLS, TEXAS

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Fewer parts to wear gives you *Longer Life*

SMITH'S Econoflo Regulators

This is a new line of popular priced regulators which give you what you want in accurate trouble-free gas flow control. Functional parts have been reduced by 25%. That means fewer parts to wear, so you get longer life with less maintenance and upkeep costs. The seats are practically indestructible. They resist wear, heat, pressure and corrosion.

An inexpensive valve stem design eliminates need for delicate, costly nozzle. Special valve construction assures smooth, level flow at *all* times from full tank pressure down to empty. Day in and day out, Smith's Econoflo Regulators give you service you'd expect only from regulators costing twice as much. Ask us for full details.

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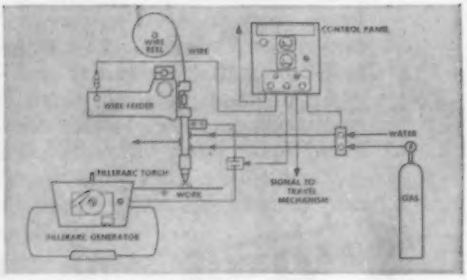


G-E FILLERARC EQUIPMENT is complete: special generator, wire feed, control panel, and automatic torch.

NEW G-E Automatic Welding System Uses CO_2 to Slash Gas Costs by 95%

FILLERARC . . . first *complete* equipment designed especially for automatic gas-shielded welding; combines improved generator with low-cost carbon dioxide—for sound welds on mild steel.

95% GAS SAVINGS are now possible with the new G-E Automatic Fillerarc Welding System. Use of CO_2—costing only **1/20th** as much as Argon—means yearly savings as high as $20,000 per equipment, on a 3-shift, 60% duty cycle basis.

SOUND WELDS ON MILD STEEL are now obtained with the exclusive G-E generator. Its rising volt-amp feature always maintains a constant arc length. This overcomes the erratic weld quality formerly obtained with CO_2.

COMPARED TO OTHER INERT-GAS SYSTEMS, G-E Fillerarc equipment . . .

- Reduces gas costs 95%.
- Delivers consistent weld quality.
- Assures constant speed in spite of normal line-voltage changes.
- Feeds wire up to 1000 i.p.m.

COMPARED TO FLUX-SHIELDED METHODS, G-E automatic Fillerarc equipment . . .

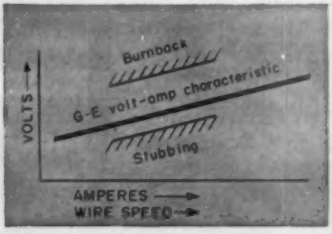
- Deepens penetration with CO_2.
- Provides visible, controllable arc.
- Eliminates abrasive flux.

FOR MORE INFORMATION contact your G-E welding sales engineer—and write for bulletin GEC-1334 to Section 713-1E, General Electric Co., Schenectady, N. Y.

SEE G-E automatic Fillerarc equipment demonstrated at the National Metal Exposition, Philadelphia, October 17–21.

Why the complete G-E system makes possible quality mild-steel welds with CO_2

UNIQUE SELF-REGULATING GENERATOR is designed especially for the process.



RISING VOLT-AMP CURVE of generator matches arc curve of CO_2 for high-quality welds.

DEEP PENETRATION is produced by short arcs, faster wire speeds of generator.

GENERAL ELECTRIC

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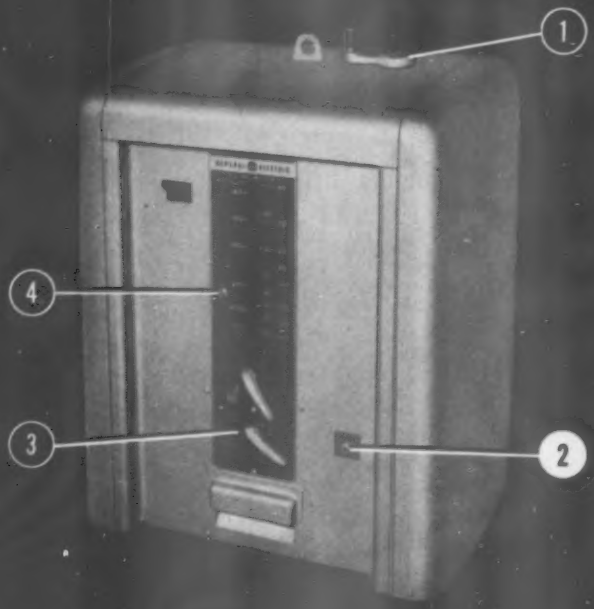
NEW G-E 300-amp rectifier welder offers full-time arc-force control



. . . and many improved features, including:

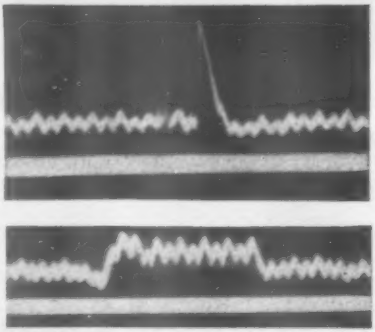
1 **FINGERTIP-ADJUSTABLE MOVING COIL:** provides stepless current control for pinpoint accuracy, reduced wear and vibration. Wide current range is 20-375 amps.

2 **ARC-FORCE CONTROL IS FULL TIME:** does not cut out in the middle of an electrode. High arc force blasts away short-circuiting metal drops, which often freeze short arcs. Results—unusual arc stability, deep penetration.

3 **REVERSING POLARITY SWITCH:** conveniently mounted for instant changing from straight to reverse polarity.

4 **SPRING-LOADED CLEANOUT SWITCH** reverses ventilating fan for blowing dust off rectifiers—prolongs equipment life.

Write your G-E welding distributor for bulletin GEA-6242. His name is listed in the yellow pages of your phone book. 710-20E



WITHOUT ARC-FORCE CONTROL, (lower graph), long short-circuit cools metal, freezes electrode. With G-E full-time arc-force control (above) short circuit is brief, metal is blasted away.

GENERAL ELECTRIC

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Welding Helmets

604-3-C with 1136 Plastic Lift-Front Glass Holder

AO† Fiberglas* Welding Helmets are

LIGHT · EXTRA STRONG

MOISTUREPROOF

NON-WARPING

HEAT RESISTANT

EASILY STERILIZED

Shells are Fiberglas reinforced and compression molded — lighter than vulcanized fibre. Reinforcement around edges provides additional strength. The ruggedness, heat resistance and superior wear have been proved in service. New No. 3C headgear will not absorb moisture, won't warp. Helmet is suspended and floating at all times — thus permits flexible headband to fit any head contour for comfort. Attached to helmet by Type "C" outside adjustable friction joint. Ratchet type head-size adjustment fits any head.

In addition to 1136 plastic lift-front glass holder (shown), helmets are available with 1130 plastic glass holder, 1096 Insulated Dowmetal Lift-Front or 1085 Insulated Steel. Filter and Cover Glass on all Glass Holders are easily inserted or removed. All Holders take either 2" x 4¼" standard or 2" x 4½" glass. New type "S" Four Position Adjustable Helmet Stop quickly adjusts to wearer in any of four positions. Your nearest AO Safety Products Representative can supply you.

American Optical
SAFETY PRODUCTS DIVISION

†T.M. Reg. by American Optical Company

*T.M. Reg. by Owens-Corning Fiberglas Corp.

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

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← Circle No. 14 on Reader Service Card.

Literature Featured In Ads This Month

(CIRCLE ON ENCLOSED POSTCARD NUMBERS OF LITERATURE YOU WISH TO RECEIVE)

2 **Automatic welding with constant voltage welder** is explained in new catalog. HOBART BROS. CO. Page 1.

5 **Gauge guard regulators** and their seven exclusive features are introduced in new bulletin. K-G EQUIPMENT CO., INC. Page 8.

6 **Portable grinding wheels** for every weld finishing application are featured in technical bulletins. BAY STATE ABRASIVE PRODUCTS CO. Pages 6-7.

7 **Aluminum welding cable** and all its advantages are outlined in technical data available. GENERAL CABLE CORP. Page 9.

8 **Versatile and efficient lifting and positioning clamps** with safety-lock feature are described in catalog. J. C. RENFROE & SONS, INC. Page 11.

10 **Complete line of resistance welding products,** including tips, wheels and holders, are featured in brochure. AMPCO METAL, INC. Page 13.

14 **300-Amp rectifier welder** with full-time arc-force control is subject of Bulletin GEA-6242. GENERAL ELECTRIC CO. Page 18.

15 **Automatic gas welding with CO_2 shielding** gas is explained in Bulletin GEC-1334. GENERAL ELECTRIC CO. Pages 16-17.

16 **Successful silver brazing** is title of new guide book. AMERICAN PLATINUM WORKS. Page 21.

19 **86 Special product solutions** are featured in new Buyers' Guide to Alloys and Fluxes. ALL-STATE WELDING ALLOYS CO., INC. Page 24.

22 **Speedy cutting of non-ferrous materials** with new process will be unveiled in literature available. LINDE AIR PRODUCTS CO. Page 27.

24 **Automatic welding wire** in a wide range of sizes and analysis are featured in Folder DH-402. PAGE STEEL & WIRE DIV. Page 30.

25 **Advantages of positioned welding** are outlined in descriptive literature. ARONSON MACHINE CO. Page 31.

28 **Portable industrial X-ray units** in a wide range of ratings are described. BALTEAU ELECTRIC CORP. Page 35.

31 **New E6013 electrode** and its advantages are subject of brochure NATIONAL CYLINDER GAS CO. Page 129.

33 **Positioner catalog explains low cost welding** and described line of welding positioners. CULLEN-FRIESTEDT CO. Page 40.

39 **Low-cost metallizing** for maintenance and repair is subject of Bulletin 55. METALLIZING ENGINEERING CO., INC. Page 47.

40 **Tank production machinery,** including offsetter and assembly press, are featured in illustrated literature. WEBB CORP. Page 48.

42 **Two new welding positioners** described and illustrated in brochure. HARNISCHFEGER CORP. Page 2.

43 **DC Rectifier-welder** and its magnetic amplifier feature are explained in bulletin. VICKERS ELECTRIC DIV., VICKERS, INC. Page 59.

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FORGINGS WERE BUTT-WELDED SINGLY—FLASH WAS SHAVED OFF AND JOB BUFFED.

FORD MOTOR

increases strength of this assembly and...

SAVES UP TO 20%

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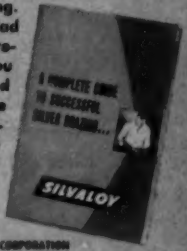
The successful combination of Ford Engineering and Silvaloy Brazing Alloy multiplies production efficiency for this Ford Transmission Gearshift Tube and Socket assembly—*with important savings in costs!* Formerly, single assemblies were butt-welded, the flash removed and joint buffed. Now, four assemblies are brazed simultaneously—without need for grinding or buffing after brazing. A Silvaloy Technician will be glad to assist in planning brazing production in your plant, to help you cut costs, improve results and speed production. Call or write today. There's no cost or obligation, of course. ★ ★ ★ ★ ★ ★ ★



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44 **Welding of dissimilar alloys** with newly developed electrode is subject of free folder. INTERNATIONAL NICKEL CO., INC. Pages 60-61.

45 **New line of automatic welders** and power sources for submerged arc welding are subject of Bulletin 1355. LINCOLN ELECTRIC CO. Pages 66-67.

47 **New line of constant-voltage welders** in 500, 750 and 1200-amp capacities are introduced. HARNISCHFEGER CORP. Pages 90-91.

49 **Complete line of grinding wheels** for weld grinding and finishing operations are featured in catalog. SIMONDS ABRASIVE CO. Page 85.

51 **Quick-acting toggle clamps** for welding and other industrial applications are featured in Bulletin. WEST POINT MFG. CO. Page 88.

52 **Portable 200 amp AC welder** and how to get it for trial use is explained in folder. KASSON DIE & MOTOR CORP. Page 89.

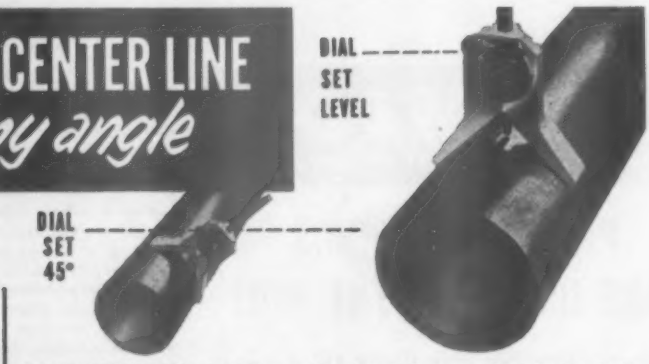
53 **Lightweight fluted welding cable** and its superiority are subject of free folder. UNITED STATES RUBBER CO. Page 75.

57 **Nine welding rods and recommendations for their** use and application are subject of Publication B-13. AMERICAN BRASS CO. Pages 104-105.

59 **32-page guide** describes more than 160 welding rods and electrodes and tells where and when they should be used. EUTECTIC WELDING ALLOYS CORP. Page 111.

61 **New flame cutting machine** for repetitive, accurate shape cutting is featured in Catalog ADC 853. AIR REDUCTION SALES CO. Page 115.

MARK A CENTER LINE *at any angle*



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TO ESTABLISH AND MARK a point at any degree of angle on shaft, pipe or tube without numerous calculations or "cut and try" methods use the Boyce Centering Head. It's a must for welders, machinists, pipe fitters and boilermakers because it is *absolutely accurate* and saves time. Small enough to fit in your pocket, it weighs only 9 ounces. Order yours today or write for information.

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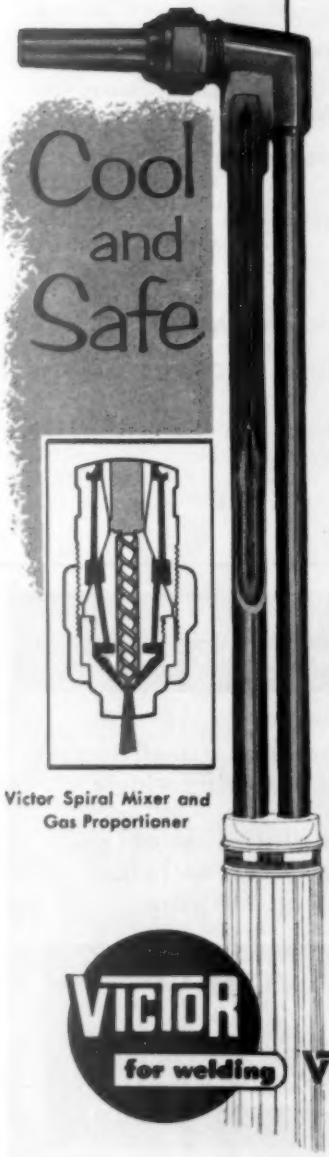

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With stainless steel head and tube assemblies.

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NOW all Victor torches and cutting attachments have rugged, stainless steel head and tube assemblies, plus time-tested spiral mixers to give you cool, safe cutting on your toughest, hottest cutting jobs. Stainless steel assembly absorbs heat slowly, withstands roughest use, is easier to maintain. Famous Victor spiral gas mixer prevents flashback and back fire, thoroughly mixes gases to make your gas dollars go further. Head and tube assembly is one unit, and can be replaced without buying a complete torch.

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25

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62 **Resistance welding alloys** for use in wheels, tips and holders are subject of informative WW Manual. WW ALLOYS, INC. Page 116.

66 **Carbon-graphite electrodes** and free sample offer are described in literature. ARCAIR COMPANY. Page 121.

68 **Complete stock** list describes complete assortment of bars, structural shapes, sheet, plate and tubing. U. S. STEEL SUPPLY DIV., Page 123.

76 **Shockproof, noiseless AC arc welder** is described in descriptive literature. MARQUETTE MFG. CO., INC. Page 131.

78 **Full story of silver brazing** is told in Bulletin 20. HANDY & HARMAN. Page 133.

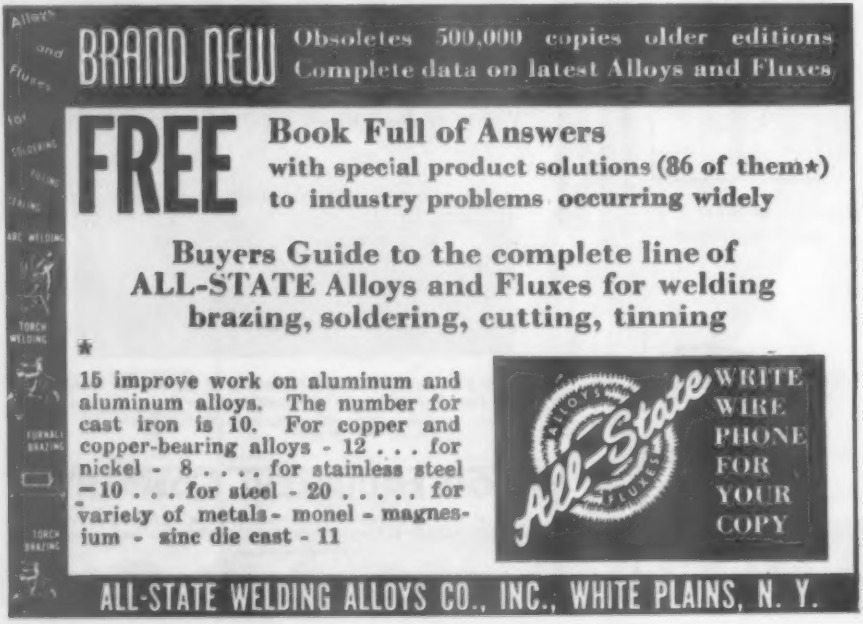
79 **Low temperature silver brazing** is subject of complete catalog. GOLDSMITH BROS. SMELTING & REFINING CO. Page 122.

80 **Resistance welding catalog** describes complete line of wheels, electrodes, holders, alloys, rod and bar stock. WELDALOY PRODUCTS CO. Page 136.

81 **Complete line of brazing alloys** for use on copper are featured in Phoson Folder. UNITED WIRE & SUPPLY CORP. Page 137.

92 **Aluminum welding cable** and its advantages are featured in Catalog. TWECO PRODUCTS CO. Page 149.

93 **Folder on flux recovery** is offered to explain advantages of vacuum-type flux recovery systems. INVINCIBLE VACUUM CLEANER MFG. CO. Page 145.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Circle No. 12 on Reader Service Card.

94 **Welding rod and repair shapes** for use on manganese steel castings are featured in Bulletin No. 451. TAYLOR-WHARTON IRON & STEEL CO. Page 146.

96 **Automatic arc welding with constant-voltage welder** is explained in literature which gives application data, prices. GLENN CO. Page 147.

97 **Better welding with correct amperages** is explained in Catalog IW-400 that tells about tong test AC-DC ammeter. COLUMBIA-ELECTRIC MFG. CO. Page 148.

104 **Three new portable clamps** with trigger-release are featured in Bulletin 482-4-6. DETROIT STAMPING CO.

105 **Powerful 2hp motor and other design features** of 9-inch industrial sander and grinder are explained in a 4-page bulletin. NEDCO COMPANY. Page 153.

110 **Fluxes for welding, brazing and soldering** are featured in Fluxine Bulletin. Page 156.

114 **Safety clothing and equipment for welding operators** is featured in catalog. ALJAY MFG. COMPANY. Page 158.

117 **Indicating and recording flowmeters** are featured in Bulletin AR-1. ELEMATIC EQUIPMENT CORP. Page 159.

123 **How to remove welding fumes** at the source is explained in Bulletin 37-E. RUEMELIN MFG. CO. Page 99.

FOR QUALITY WELDMENTS USE

***Drawalloy* CORPORATION**

QUALITY CONTROLLED

STAINLESS STEEL

Welding Wire

- **available in Spools, Coils and Lengths**
- **for Automatic and Semi-Automatic gas and inert arc welding**

Welding wire by Drawalloy is made to an exacting high standard . . . a high standard established by long-experienced welding men who know welding wire and how it must work. Set-ups for automatic and semi-automatic welding take more time than regular welding. That's why you want to be sure of satisfaction *before* you start. This *reliable* wire is weld-tested to give the best results every time. Write today for complete information and prices.

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LINDE's new metal cutting process will change the entire economic picture of non-ferrous metal fabrication. Look for LINDE at the METAL SHOW and see a live demonstration of how you can slice through ¼-in. aluminum plate at *300 inches per minute*—leaving a saw-like cut—with this new cutting tool.

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Q. What's new in weld grinding?

A. Norton B-11 wheels— for your heavier jobs

Q. What's new about B-11 wheels?

A. Their great new resinoid bond, improved uniformity and balance, new "TOUCH of GOLD" performance-benefits

Q. What is the B-11 bond?

A. It's the latest Norton resinoid bond. B-11 wheels made with it are excellent for heavy weld grinding.

Q. Why?

A. Because B-11 wheels are more uniform in structure, with better balance. As a result, they "hug that work" closer, grind cooler and faster, with less vibration and bounce.

Q. What about these "Touch of Gold" benefits?

A. They're the direct result of the B-11 wheels' more efficient grinding action. They include new standards of balance which mean less operator-fatigue and longer wheel life — and they add up to more profitable grinding for *you*.

Q. Any other advantages of B-11 wheels?

A. Many others. You get closest possible wheel duplication. Hardness increments are evenly spaced throughout the entire grade scale. And B-11 wheels can be supplied in half-grade increments, making it even easier for you to choose exactly the right wheel for every job.

Q. Sounds fine — what about more information?

A. Your Norton Distributor will gladly give you the whole story on new B-11 wheels. Or write us direct. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

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W-1672

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
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3 Big Reasons for Buying PAGE Automatic Welding Wire

1. PACKAGED TO FIT YOUR PARTICULAR REQUIREMENTS
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3. GREATEST CONVENIENCE—YOU CAN BUY FROM LOCAL STOCKS

PAGE packages its great line of welding wires in a variety of ways for utmost protection and convenience in handling, stocking and using.

Some of these packaging methods are shown at the left...There are lightweight, durable Leverpaks which give protection against coil distortion or wire corrosion. Easily opened and resealed, they roll easily and stack perfectly. They take a minimum of floor space.

There are single and pallet-mounted (1,000 lb., 2,000 lb., 3,000 lb.) coils, each wrapped in waterproofed paper and held secure by steel strapping; thread-wound, 25-pound reels to fit popular machines; also, coils in individual cardboard cartons, available singly or palletized for handling by fork-lift truck.

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These "cover the waterfront" of applications: heavy automatic submerged arc...light manual submerged arc...inert gas manual and automatic, tungsten or metal arc.

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Your welding job deserves the *right* electrodes and the *right* rods—and you can get them from the wide range offered by PAGE!

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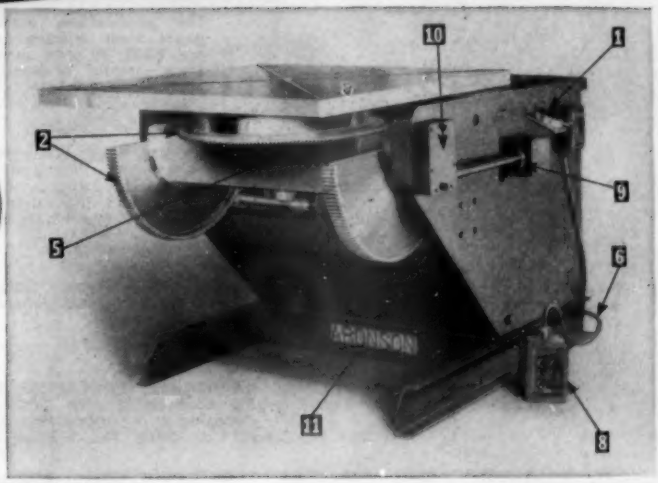

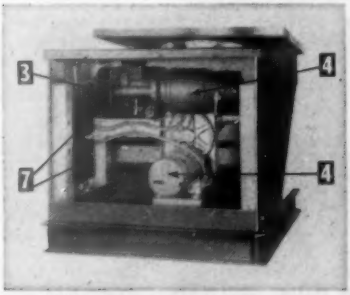

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Aronson MACHINE COMPANY

ARCADE, NEW YORK

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NEW REFERENCE DATA

The publications featured on these pages were written by experts. They are FREE to our readers. To obtain these helpful reference materials use postcard bound into this issue.

40 WAYS YOU CAN USE WET ABRASIVE BLASTING to cut finishing costs are beautifully illustrated and discussed in a colorful 18 page handbook prepared by American Wheelabrator & Equipment Co. Easy to read, the pamphlet contains a section fully explaining the process and necessary equipment. **Circle 130.**

X-RAY EQUIPMENT for weld inspection is described in graphic folder published by High Voltage Engineering Corp. Heavy duty one million volt x-ray generator is featured with performance data. **Circle No. 131 on Reader Service Card.**

INDUCTION HARDENING, ANNEALING, BRAZING OR HEATING for forging or forming with "Tocco" induction heating equipment is discussed in an interesting bulletin available from Ohio Crankshaft Co. **Circle No. 132 on Reader Service Card.**

"STANDARD OF THE AIRCRAFT INDUSTRY" is the way in which Sciaky Bros., Inc., describes its PMCO 2ST air-operated, press-type spot welder in 8-page Bulletin 334-3. Charts, photographs, schematic drawings and tabular data are included. The machine's 3-phase feature is described in detail. **Circle No. 133 on Reader Service Card.**

SAFETY CLOTHING AND EQUIPMENT of all kinds, not only for the welding industry, but also for the steel mills, foundry and metal working shop, are listed in the latest catalog index issued by Safety Clothing and Equipment Co. Hundreds of stock items are listed. **Circle No. 90 on Reader Service Card.**

SEVEN THINGS TO KNOW WHEN BUYING POSITIONERS are explained in 8-page Bulletin R-1700-B-15 issued by Worthington Corp. Selection of correct positioners is explained. Included is information on table rotation and tilt range, maintenance and repair, range and selection of variable speed drives and safety features. **Circle No. 134 on Reader Service Card.**

APPLICATIONS FOR LOW TEMPERATURE BRAZING are featured in Booklet No. 69 published by Handy & Harman. Illustrated case histories point out the advantages of low temperature silver brazing for joining non-ferrous metals. **Circle No. 135.**

200-AMP ENGINE-DRIVEN WELDER is announced by the General Electric Company in their new bulletin GEC-1333. Among the features mentioned are smooth, slow running Hercules which will keep the welding machine in action 13 hours at full-load rating on tankful of gas; NEMA rated; superior arc characteristics; and a slowdown control which saves on gas and oil and reduces wear. **Circle No. 136 on Reader Service Card.**

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CADDY Arc Welding Accessories are all designed to utilize the finest of all electrical connections—CADWELD. From welding machine to electrode, the CADWELD connection has revolutionized the arc welding circuit. Today after five years of on the job analysis, companies all over the United States are standardizing on CADDY Arc Welding Accessories and CADWELD cable splicing.

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5. Cost Analysis . . . "lowest"

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IN CANADA: ERICO INCORPORATED, 3071 Dundas St., West, Toronto 9, Ontario

Circle No. 26 on Reader Service Card.

RESISTANCE WELDING ELECTRODES, HOLDERS, AND TECHNICAL DATA are included in an unusual bound manual available from Tipaloy Incorporated. The material covers established standards, glossary of resistance welding terms, comparison chart, and equipment available from this company. **Circle No. 91.**

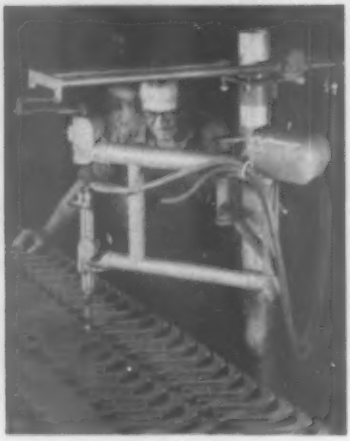
PROFITABLE APPLICATIONS FOR "LOW HEAT INPUT" METAL JOINING are featured in 4-page, two-color folder TIS2496 available from Eutectic Welding Alloys Corp. Procedures are given for use on many common metal joining jobs. Techniques and alloy recommendations are given for cast iron repair without pre-heat and for joining steels with extremely high joint strengths. **Circle No. 137 on Reader Service Card.**

"POOPED BY NOON" is the title of a short, short dialogue concerning aluminum welding cable. It is billed as a sad story —with a happy ending. The very least we can guarantee is that if you read this useful, informative brochure, you will be impressed with the story. Concerns a product of Tweco Products Company. **Circle No. 92 on Reader Service Card.**

101 AIDS FOR INDUSTRIAL RADIOGRAPHY are contained in a new 48-page brochure issued by the X-Ray Department of General Electric Co. Known as Industrial X-Ray Supplies and Accessories Catalog, brochure is complete with an extensively indexed and cross-indexed table of contents, an enclosed price list and thorough explanations on how to get the most out of the many products shown. **Circle No. 138 on Reader Service Card.**

WEDGE BARS AND TRACTOR GROUSER BARS are described in a new loose-leaf bulletin released by Stulz-Sickles Co. Specifications include drawings, instructions on their use and convenient price information. **Circle No. 139 on Reader Service Card.**

NEW CONSTANT VOLTAGE ARC WELDER designed primarily for automatic applications, is described in bulletin J-6199 now available from Hobart Brothers Company. Welder is described as a constant voltage power source that eliminates automatic and semi-automatic welding control problems. **Circle No. 2 on Reader Service Card.**



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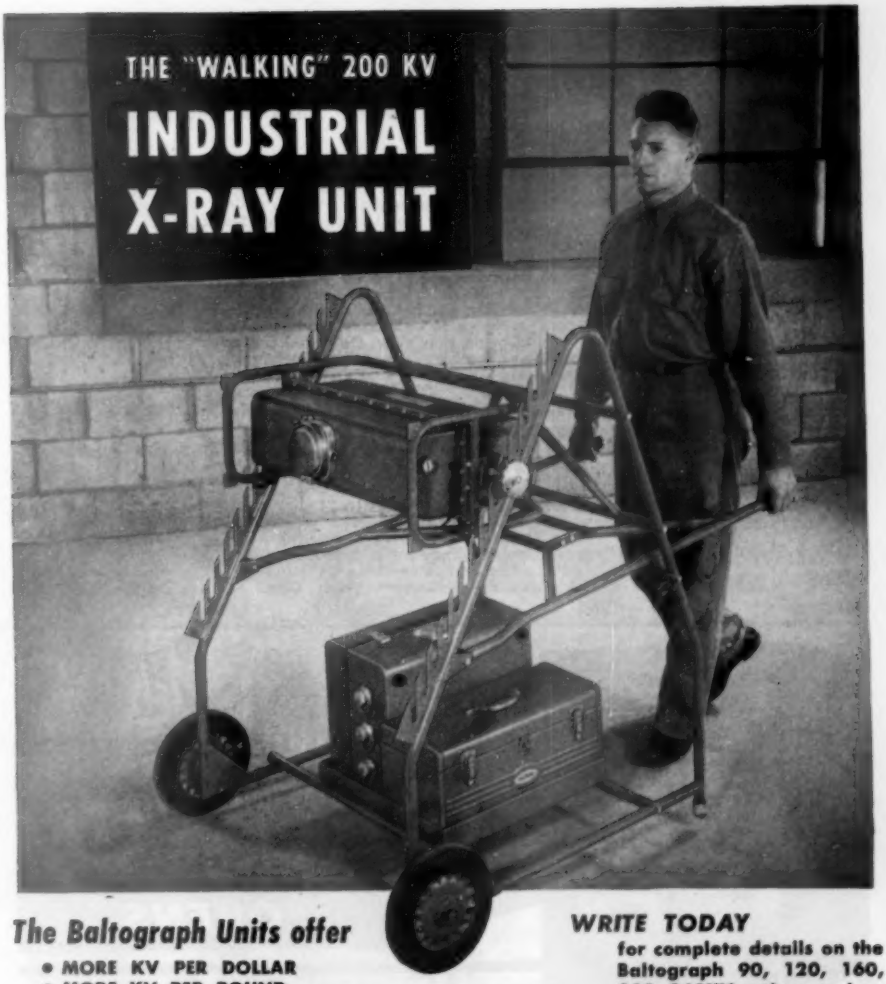

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TUNGSTEN CARBIDE HARDSURFACING is explained in detail in a colorful, 4-page brochure offered by Coast Metals, Inc., to introduce their new tungsten carbide rod. Complete instructions are given for applying the rod with oxy-acetylene flame, manual and automatic arc welding. **Circle No. 140 on Reader Card.**

A CHROME-NICKEL-MOLY STAINLESS STEEL is fully and thoroughly described in Allegheny Ludlum Steel Corporation's fifth technical study. Composition, mechanical, physical and corrosion properties, effects of heat treating, annealing and hardening, and applications, all are covered in a practical useful manual. **Circle No. 141 on Reader Service Card.**

DUAL-PURPOSE SPOT AND PROJECTION PRESS WELDERS are the object of an effective, informative new brochure, No. 101, available from Kirkhof Manufacturing Corp. Flexibility is emphasized. Welders accommodate a wide range of electrodes, mountings and projection dies. Data includes installation figures, electrical and welding application information. **Circle No. 142.**

COMPACT PORTABLE HARDNESS TESTER shown in a new brochure put out by the Industrial Overlay Metals Inc. is said to be a direct reading type which requires no calculations, fast to use and accurate. Set includes tester, measuring microscope test block, etc. **Circle 143.**

BARE ALUMINUM WELDING AND BRAZING RODS containing an alloy, are described in a folder issued by Welding Alloys Manufacturing Co. Easily inserted in a loose leaf shop note book, the folder describes the brazing process and its applications. Cost comparison is made with other forms of bonding metals. Price data is conveniently given. **Circle No. 144 on Service Card.**

KILL moisture absorption with DESPATCH ROD DRYING OVENS

It's an accepted fact that certain electrodes in storage tend to gather moisture and CO2. This applies to low-hydrogen, stainless steel and non-ferrous electrodes. The amount of moisture is related not only to the percent of relative humidity, but also to the length of time that electrodes are stored. Despatch "WRD" Welding Rod Ovens provide lots of storage room in 10 spacious compartments and do a thorough, steady, dependable dehydrating job. *Specifications:* Outside dimensions—18"x19"x18", Max. Temp. 550° F; 250 lbs. rod capacity. *Write for Bulletin.*

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★ Operator works steadily—rework time cut
★ Automatically controlled—set it and forget it
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★ Conveniently portable for entire shop use

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The inside story of the superiority of Norris-Thermador Acetylene Cylinders is the charcoal type monolithic filler. The charcoal used as one of the filler components comes from selected Washington fir of a very special quality. The trees used are those grown at a certain altitude, and must be of a specific age, height, and diameter of limb. This special charcoal, manufactured under controlled processing conditions, must always conform to rigid Norris-Thermador standards—both as to the type of wood itself and size of granule. It combines perfectly with the other filler components of diatomaceous earth, asbestos, and cement to provide a filler which holds more gas and hugs the inside cylinder wall to assure better welding jobs and greater safety.

OTHER EXTRA VALUES

Check them: Cold-drawn construction . . . light-weight for easy handling . . . bases curled under for maximum strength and compact storage . . . larger cap holes—tags easily read without moving caps . . . all welding X-ray controlled . . . specification ICC 8 met and exceeded.

Acetylene cylinders from 10 to 300 cubic feet capacity. Write or wire for specifications on all sizes. Cable: Northerm

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NORRIS-THERMADOR
CORPORATION
5215 South Boyle Avenue, Los Angeles 58, California. Dept. IW-1055

Circle No. 30 on Reader Service Card.

STAINLESS STEEL ELECTRODE SELECTOR GUIDE printed in two colors is available from Alloy Rods Company. Material presented includes designations, electrode data and application data for 22 different classifications of rod. Welding current ranges are also shown. **Circle No. 145 on Reader Service Card.**

A LOW COST WELDING AND CUTTING OUTFIT has been announced by the Dockson Corporation and is featured in their new 64-page catalog. Known as #600 Outfit, it includes regulators, welding torch and tips; cutting attachment; siamese hose; etc. Details show specifications, advantages and applications. **Circle No. 146 on Reader Service Card.**

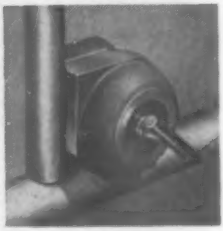
CONSTANT POTENTIAL RECTIFIER TYPE DC ARC WELDER is introduced in descriptive bulletin 26-180, published by Westinghouse Electric Corp. This bulletin gives an effective, concise account of the applications, advantages, design features, and performance characteristics. **Circle No. 147 on Service Card.**

FUME EXHAUST HOSE said to be non-crushable, is described in a new folder issued by Engwald Corporation. Hose is stated to be light and compact and of rugged construction. Folder is illustrated; contains specifications and demonstrates adaptability. **Circle No. 148.**

PORTABLE AND FIXTURE-TYPE RESISTANCE WELDING GUNS, said to be versatile, efficient and easy to apply, are described in the latest brochure available from Craft Welding Equipment Co. Included are photographs, scale drawings, design and application data. **Circle No. 149 on Reader Service Card.**

pays for itself in a week

The Welder's mate . . . . . Use it for holding pipes, bars, angles, plates or sheets, on all classes of welding. Save a pair of hands, time and money.



MAGNETIC HOLDER

Eclipse

PM 19

For descriptive literature and address of sales agent in your area, write to

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37/39 PEARL STREET, NEW YORK 4.

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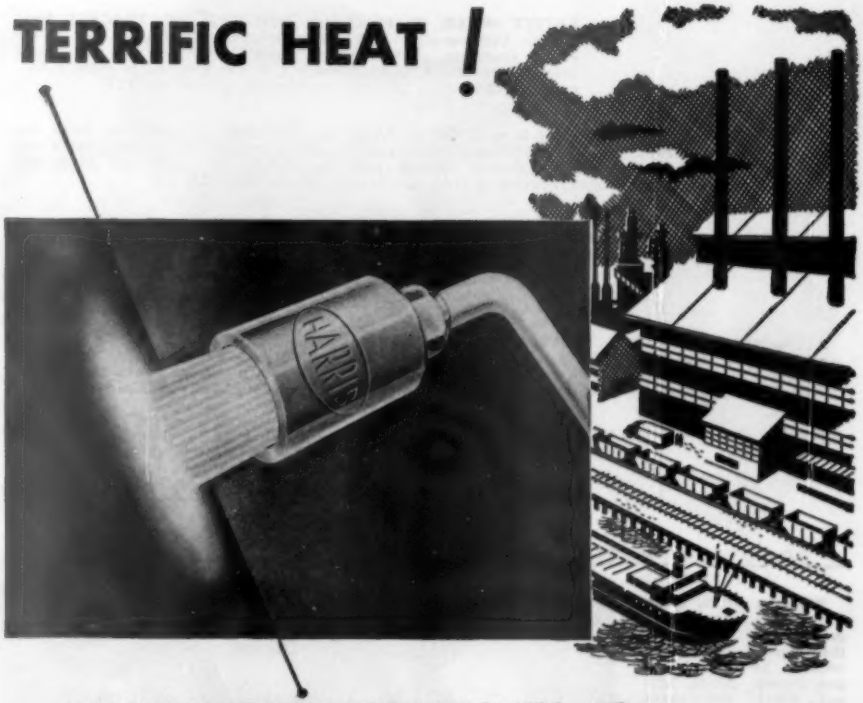
TERRIFIC HEAT !



HARRIS SUPER-HEAT TORCH NO. K23

Heat is the Prime Factor utilized in connection with Innumerable Metal Working Operations. While it is a fact that the Oxy-Acetylene Welding Torch is universal in its applications, there are many Operations requiring a much greater volume of Intense Heat than can be obtained from a Welding Torch.

A definite limitation exists relative to the amount of Oxygen and Acetylene Gases which can be safely mixed without danger of the Flame "Back-firing", due to the extremely fast Flame Propagation Characteristics of such Gas Mixtures. On the other hand, much larger volumes of such Fuel Gases as Propane, City Gas and Natural Gases can be safely mixed with Oxygen on account of their lower rate of Flame Propagation. It is evident the larger the volume of Gases mixed, the greater the Flame and resulting Heating Value. This produces the truly phenomenal results achieved by this Harris Super-Heating Torch.

The applications of this Harris Torch are unlimited, where large volumes of Intense Heat are required, either as a Portable or Stationary Unit. In places where Massive Shafts are to be Straightened; Large Size Pipe Bent; Flanging or Straightening of Steel Plates; Brazing Heavy Copper Pipe, etc., etc., this Harris Torch, with its **TERRIFIC HEAT**, is the answer.

HARRIS 50 YEARS 1905 1955 50th ANNIVERSARY

SEND FOR DESCRIPTIVE FOLDER NO. 540710

THE HARRIS CALORIFIC CO.
CLEVELAND 2, OHIO

Circle No. 32 on Reader Service Card.

LATEST WORD IN HEATING AND CUTTING TORCHES from Weldit Incorporated, is a new, pocket size brochure, No. M-17. Aside from its attractive format, it is packed full of useful information about paint burners, L-P gas torches, plumber's furnaces, and heating and cutting torches. **Circle No. 123.**

THREE ARTICLES ON X-RAY AND MAGNETIC PARTICLE TESTING are available from the North American Philips Co., Inc. The first deals with twenty questions and answers on X-ray analysis, another with magnetic particle testing, and the third is a reprint of an article from Textile Age on the usefulness of X-rays in research. **Circle No. 124.**

NEW PORTABLE FIRE-RESISTANT CANVAS SAFETY SHIELD, lined with 14 gauge all-welded galvanized wire, is adequately described in the latest Frommelt Industries brochure. Portable, light in weight, these large canvas shields are said to protect property and personnel. Price data is included. **Circle No. 125.**

ALUMINUM PRODUCTS—SHEETS, PLATES, TUBING, SHAPES AND BAR STOCK are described in a new Peter A. Frasse & Company, Inc. brochure. Indexed for ready reference, technical and practical aspects of aluminum fabricating are shown in various charts and tables. Properties, applications and size ranges are also shown. **Circle No. 126 on Reader Card.**

SEEING ISN'T ALWAYS BELIEVING . . . it depends on what is seen! That's the somewhat cryptic title of a 12-page catalog that sums up the Magnaflux Corporation's methods for detecting defects. Covered are magnetic particle, black light, fluorescent penetration, sonic and filtered particle inspection methods. Case histories illustrate each method and point out advantages. **Circle No. 127 on Reader Service Card.**

When a touch on a button moves weldments like these into the correct, most convenient position for a downhand pass, you get more arc time, more welding at lower cost. C-F power operated Positioners rotate the work in a full circle at any point in a range of 135° from the horizontal — giving welders a choice of an infinite number of downhand welding positions instantly.

Every requirement for faster, better positioned welding — constant or variable speed table rotation, full 135° tilt, self-locking gearing which holds the table in any position, oversize built-in main tilt and rotating bearings, choice of two base styles, and many other features—are built into C-F Positioners.

C-F Positioners are available in Hand or Power operated models, and are made in capacities up to 20,000 lbs. and larger.

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C-F positioned welds mean better, more economical welds

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

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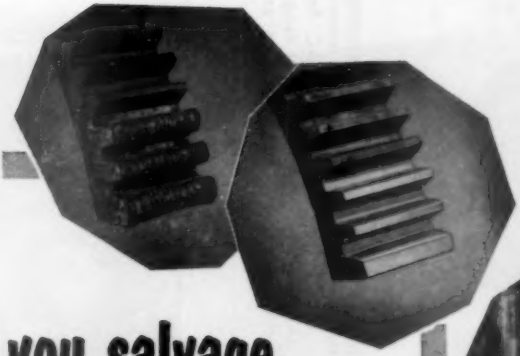

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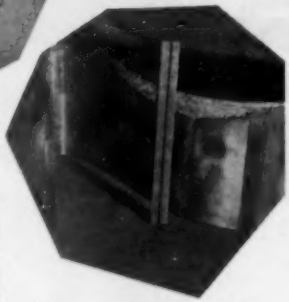
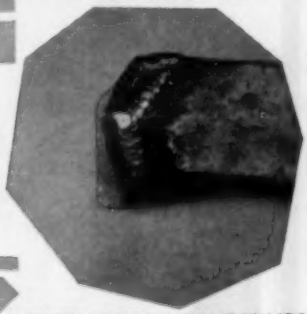
. . . with Nickel-Arc



PROFITABLE SALVAGE
. . . with Nickel-Arc



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If you salvage, repair, or assemble Iron Castings use NICKEL-ARC electrodes

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no finer electrodes made . . . anywhere

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NO SINGLE WELDER WILL DO IT ALL!

THERE'S EXACTLY

THE RIGHT **miller** WELDER

TO MEET EVERY WELDING REQUIREMENT

MILLER SR RECTIFIER TYPE DC ARC WELDERS

Available in 200, 300, 400 and 600 amperes, it is a superior direct current welder using Miller Unitron transformer control and selenium rectifiers for conversion from 3 phase AC line current. Miller SR Welders feature widest possible current range, extreme arc flexibility, maximum electrode deposition rate and highest electrical efficiency.

THE *New* MILLER SRH RECTIFIER TYPE DC ARC WELDER

A new concept in welder design for all DC metalic arc welding. Available in 200, 300 and 400 amperes. It is ruggedly constructed, compact, and is designed to lend itself to stacking for parallel operation or to conserve floor space. It has single range control and is weatherproof.

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THE *New* MILLER MULTI ARC COMBINATION AC-DC WELDER

Available in 14 models, this new Miller Welder provides both AC and DC welding power for applications where both are required. It operates from a single phase power line and is available with high frequency and controls designed especially for inert gas arc and spot welding.

MILLER ARC WELDERS FOR TUNGSTEN ARC WELDING PROCESS

These Miller Welders feature the patented Miller UNITRAN control circuit which combines the transformer with its own integral flux diverter. This, in conjunction with adequate open circuit voltage, high frequency, balancing resistor and optional controls insures superior uniformity and flexibility throughout the entire welding range. Available in nine models.

MILLER 100 SERIES HEAVY DUTY INDUSTRIAL TYPE AC WELDERS

Designed for heavy production welding and automatic welding applications. Available in eight models. The 100 Series Welders permit faster welding—as much as 35% faster. Movable coil design and 80 volts O.C.V. produces uniform and better welding characteristics throughout the entire range of the welder.

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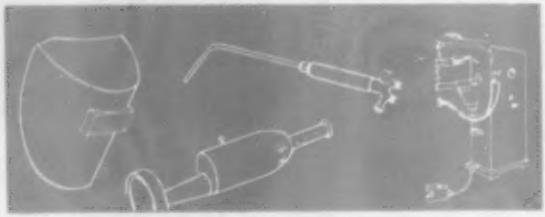
index to products advertised this month



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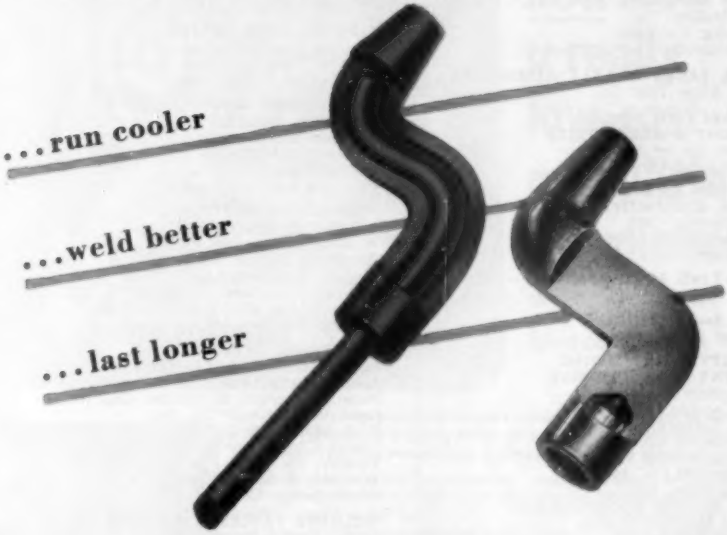
MALLORY Cold-formed Electrodes



By means of special cold forming techniques, Mallory produces single-bend, double-bend and irregular shaped electrodes which have properties superior to those obtainable by conventional casting or hot forging.

They run cooler—because the cooling water tube goes closer to the tip. The tube can be bent in place*, and thus follows the shape of the electrode. The exclusive Mallory fluted cooling hole, which provides increased cooling area, can also be provided in these irregular electrode shapes.

They weld better—because cold forming develops strength and hardness considerably higher than that of cast or forged metals.

They last longer—because the combination of cooler operation and higher strength add up to longer runs between dressing . . . lower cost per weld.

Scores of "special" shapes can be produced promptly and at economical cost from Mallory's standard tools. You will probably find the exact style your application needs, in the Mallory series. For technical data, or for a consultation on your welding problems, call your local Mallory Welding Distributor . . . or write to Mallory today.

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*Patent Number 2489993

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

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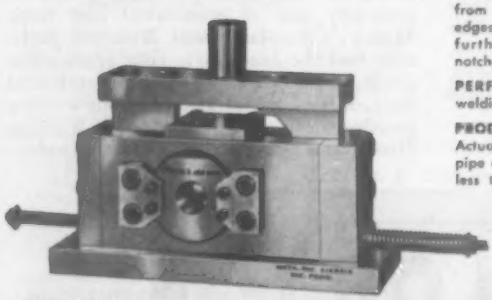
NOTCH

THESE ENDS WITH ONE STROKE OF PUNCH PRESS

ARC-FIT TWIN NOTCH



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NO DEFORMATION Shears from inside out—cuts clean edges; eliminates need for further finishing; aligns notches automatically.

PERFECT "T" Joints for welding or brazing.

PRODUCTION NOTCHING Actual production time per pipe or tube end reduced to less than 3 seconds.

INTERCHANGEABLE Punches and dies up to 2⅜" O.D. pipe or tube for STANDARD TWIN NOTCH. (Special units available up to 3" O.D.)

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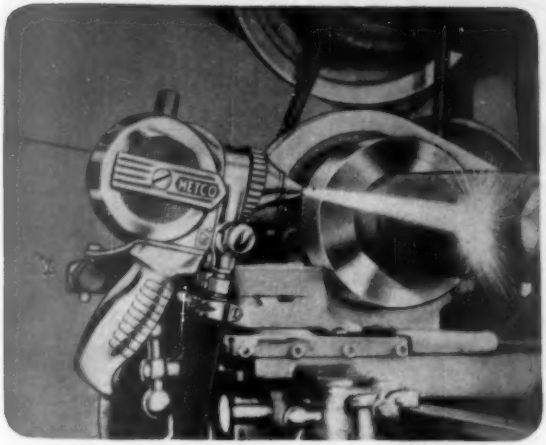

now a really low-cost metallizing installation...

with the *new* Metco L-Gun

New, low, compressed-air requirements . . . only 10 cfm at 40 to 60 psi, already available in many shops, or supplied by inexpensive 3 hp compressor . . . bring metallizing within reach of the small user.

Metallizing damaged journals on turbine shaft

Building up worn brake-drum

Metallizing protective coating on steel plate

Here's a chance for the smaller maintenance shop to get into profitable metallizing operations like these:

- Save up to 90% of replacement costs on machine repair jobs,
- Do your own hard-facing,
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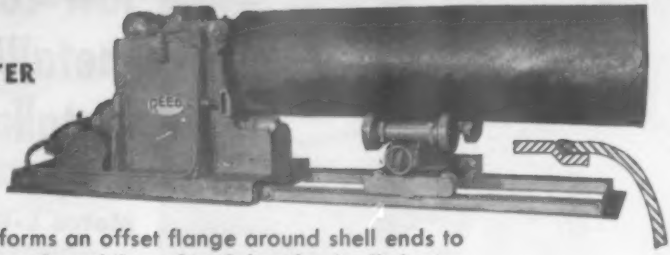
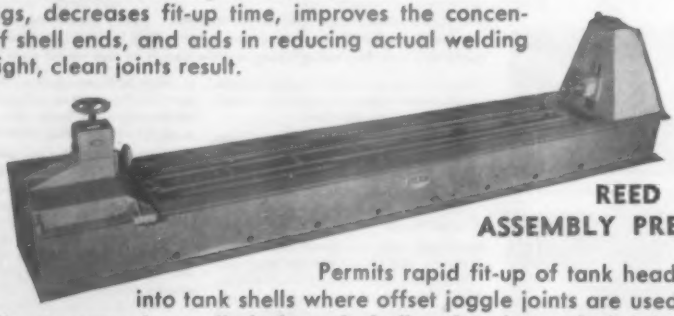


This machine forms an offset flange around shell ends to facilitate automatic welding of tank heads. It eliminates chill rings, decreases fit-up time, improves the concentricity of shell ends, and aids in reducing actual welding time. Tight, clean joints result.



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Weld with Wagner

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The purpose of this issue is to give our many readers a glimpse into the future of welding and the welding industry. This future is shown here in its true perspective by men who have grown up with the industry, men who are largely responsible for many of the revolutionary new developments that have taken place in recent years. These important readers of INDUSTRY & WELDING have contributed to the expansion of welding by their suggestions for improvements in existing methods and the development of new ones.

These scientists, engineers, supervisors and production experts have a message to pass on. Their satisfaction over the many "firsts" scored by the welding industry might justify a certain amount of complacency on their part. However, the positive tone of their messages and the enthusiasm they show for the future cannot help but "brush off" on the rest of us.

THE EDITORS

THE FUTURE FOR WELDING

by J. H. **HUMBERSTONE**, President
American Welding Society

TO forecast the future of welding one need only observe the application of this process in a modern metal working plant. The evidence is inescapable.

In the relatively few years welding has served as a tool of industry, it has become practically indispensible. Much of this has been caused by the astounding strides made by improving the tools and techniques of the process. And, much of this technical development is of fairly recent origin. This aggressive expansion is a distinct tribute to manufacturer and user alike. It is a compliment also to the American Welding Society which, for thirty-six years, has confidently promoted the virtues of welding and encouraged experimentation and development.

Great Expectations

All of us connected with the welding industry have the greatest expectations as to its future. Not only is welding today an "arrived" tool of industry — it is on the threshold of performing even greater service. As witness—the continuing developments in machine welding, contour welding, the ever increasing expansion in the use of the inert gas processes, the improvement in welding machines and the emergence of brazing as a high production tool through the further development of furnace brazing and dip brazing. In cutting operations, of course we should not overlook famous electronic controls that have improved shape cutting so appreciably.

Most of these advancements, 10 years ago, were in a comparatively coarse state of practical development as we look back on them now.

Hardly a month goes by that we

(Continued on Page 98)

as seen by

J. H. HUMBERSTONE, President AMERICAN WELDING SOCIETY

E. C. CALUWAERT, President NAT. WELDING SUPPLY ASSOC.

by E. C. CALUWAERT, President National Welding Supply Assoc.

WELDING equipment of the future will be designed and built for definite production applications. It will not be necessary for production engineers to fit their design and processes to standard welding units. As a result, present classifications of equipment as to fixed sizes and capacities will probably tend to lessen in importance.

The use of welding, even for alloys and non-ferrous metals not presently utilized, or even known —will expand during the next 10 years.

Manual welding, as such, will probably become less important as a production process, and much more important for maintenance, in-plant fabrication, repairs and low-volume production work.

Large welding volume on a production basis, will be done with automatic and semi-automatic equipment. Controls will be better and more regularly utilized. Improvements in equipment, techniques and filler materials will reduce the need for gases used for heat or shielding purposes.

Jigs, fixtures and work transfer equipment for bringing material to and from welding stations will be as important and probably more costly than the actual welding equipment used.

"Engineering Know-How"

All this means that welding equipment used in production work will no longer be a stock item to be sold from a manufacturer's warehouse or a distributor's store. Manufacturers and distributors serving the production market will succeed because of their "engineering" know-how and service, rather than because of their ability to produce in volume or to sell at low prices.

THE FUTURE FOR WELDING

by W. G. BOESE
Chief Welding Engineer
Pullman-Standard Car Mfg. Co.

SINCE this is concerned with welding at Pullman-Standard Car Manufacturing Co., it is well to start by considering just a bit of the history of the PS-1 box car, our company's first standardized railroad freight car. It is logical to do so because the big developments in Pullman-Standard welding have resulted, primarily, from top management decisions, in 1946, to develop standardized products — better designed, mass-produced, lower-cost freight cars — for the nations' railroads.

Progress, as a rule, starts with a problem. The Pullman-Standard welding story is no exception. Back there in 1946, working on a design for automatically welded joints to be used in the new PS-1, we ran into many problems, and consequently learned a great deal. For one thing we found out just how far the AC transformer would take us. We also did a lot of research using a generator set. The AC transformer gave us smoothness up to 60 inches a minute but could not deliver the welding quality we wanted at higher speeds. On the other hand our work with motor generators indicated that we could get quality at 80-105 inches a minute.

At any rate it was this problem of needing both quality and speed for mass-production that gave impetus to the vast amount of welding research that has been and is being done at Pullman-Standard.

Waste Time Cleaning Plate

Back in 1946 we tooled up the plant at Michigan City, Ind., for the first PS-1 box cars. At that time we ran three sides an hour on sub-assembly. And it didn't take us long to realize that both day and night shifts were needed on the side sub-assembly to keep up with the erection line. We were using single rod feed on our automatic heads and even though the speeds were relatively high, a lot of valuable time was being lost because

at Pullman-Standard Car Manufacturing Co.

Two-headed welding unit used on freight car roofs. One head starts at crest, welds down to roof edge; other welds from edge up to crest.

Only unit of its kind in the car-building industry automatic circular hatch welding unit is used on cover hopper freight car.

of the necessity for cleaning sheet edges in preparation for actual welding.

New Developments Speed Production

It took about six months to whip this problem, the solution being found in the development of double-head automatic welding. The need for cleaning was eliminated with the double head because more time was allowed for gases to escape the molten pool. We also had a sounder weld; and higher welding speeds were readily obtained. Production jumped from three sides an hour to six sides an hour almost immediately. Incidentally, further improvement has since been achieved by introduction of triple-head welding, which enables us to reverse direction of travel without changing the head. Our welding speed in inches per minute has subsequently been raised in excess of 150.

An important by-product of this early research showed up in reduced distortion in assembled sheets. Higher speed of welding was the factor here. We are now convinced that higher speeds and reduced distortion go hand in hand. The trick, of course, is to do the job economicaly without sacrificing quality. Through research we hope to achieve the optimum.

Materials Are Important

The importance of materials can be appreciated when it is considered that one hopper car line will take close to 10,000 pounds of electrodes per day. We get minimum 40,000 pound carload shipments. Figuring a carload a day, five days a week, this amounts to 200,000

Ninety-nine percent of welding at Pullman-Standard is done in downhand position. Two complete hopper car bodies are being positioned here. One hopper car line used 10,000 lbs. of electrodes per day.

To Keep Us Occupied"

pounds of electrodes per week. That, of course, is a lot of rod and it all must be "right"—our reputation depends on it.

Pullman-Standard uses AWS classification electrodes; 6010, 6011, 6012, 6013, 6020 and 7016. These must also meet our own specifications of X foot pounds at Y subzero temperatures. We use a Charpy V notch specimen and test on a 220 pound impact machine.

Our testing research work is heavy and expensive, but Pullman-Standard management recognizes that this expenditure is much more economical than putting out an inferior product which might develop failure in the field—with consequent bad customer relations.

The policy has paid off. Because of this extensive research effort we have practically eliminated failures in welding. As a result, too, we now can do 99% of our welding downhand. Both operator comfort and better quality have resulted.

Cooperation Between Departments

Naturally, we maintain close collaboration with those responsible for company research and product engineering functions. By a free exchange of ideas and assistance, welding problems which have their basis in design are quickly eliminated. Also, new designs can be made to anticipate advantageous welding procedures to the greatest possible extent.

It is an established policy that we do not rely on the railroad customers' inspectors to dig up mistakes or inferior welds. Pullman-Standard has its own group of inspectors who jealously keep watch on established welding standards. In every case these inspectors must have been, and are, qualified welding operators. Quality welding dictates the setting up of high standards.

Double-headed welding unit joins stakes to hopper car sides at Pullman-Standard's Butler, Pa., plant.

Four Variable Factors

Assuming adequate design, there are really just a few factors with which to work in this business of welding; metal, electrodes, electricity and welding operators. All four factors are variables. It is therefore axiomatic that pressures of modern-day competition demand tight control over all four factors. For that reason Pullman-Standard leans heavily on its system of weld testing and inspection.

Which brings us to the future.

What are the problems that will

make for welding progress in the years ahead?

Much has been said in this paper about metal, electrodes and welding operators. Not too much, however, has been mentioned about current. Because much work remains to be done on this factor, it more properly comes under the heading of research for the future.

Work on AC-DC Welding

Pullman-Standard welding engineers are doing a lot of work on AC-DC welding. We are also, at this moment, exploring rectifiers and constant potential units for automatic welding. It is hoped that within the next few years equipment will be developed to the point where Pullman-Standard can successfully use transformer type welding equipment to maintain constant quality, speed and appearance. This would constitute a big step forward. Although constant potential sets are available now—but we have not yet been able to reach our required quality and speed with them. Our operations require speeds of 150-175 inches a minute.

Another direction for welding progress lies in the shielded gas method. We are confident that this type of operation will come to the fore soon.

And still another sticky welding problem concerns the great variation in chemical analyses of electrodes and flux. This factor, troublesome to control, is the subject of much engineering thought.

Grounding Is A Problem

One of the writer's own pet projects concerns the problem of setting up proper type of equipment grounding for each individual job. Pullman-Standard has 41 automatic heads in operation at one plant, 37 at another and 27 at a third. In each case the individual head has been independently set up to obtain proper ground to eliminate pesty magnetic disturbances. Trial and error has been our best method, indeed our only method, for setting up satisfactory production procedures. In one case it was necessary to change a particular set-up from a north-south location to east-west before the problem of magnetic disturbance was solved. In another case we tried everything, to no avail, until someone hit on looping the ground wire around part of the jig. This did the trick. We still don't know why.

It is a personal opinion that answers to these disturbances will be found in a study of the effect of the earths magnetic forces on the arc. At any rate, we have not been able to apply any known laws to localized plant layout conditions. Solution of such problems will come from future experience and analysis. Though it is easy to overcome many of these troubles by slowing down the travel speed, this is not economical and tends to create distortion.

No Lack of Problems

We are certainly not lacking in welding problems to occupy us in the years ahead. Even now, at Pullman-Standard, production of railroad cars is set up on the basis of how many inches of quality weld we can deposit each minute. Increased production therefore naturally translates itself to us as increase in speed while maintaining quality. We believe that con-

(Turn to Page 61)

gives complete, automatic arc control

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...vertical
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Nick has a hard time explaining this one

I come into the house as quiet as a mouse wearing moccasins. But it doesn't help.

'Nick, *where* have you been?'

'Working, honey. I told you I'd be late. The boss wanted me to make up a list of all the important things about the Inco-Rod "A"* electrode. And you know I'm no good at paper work.'

No answer. It's as cold as Mt. Everest at the top of those stairs. And a feller can get killed climbing mountains.

'It's the new welding rod for dissimilar alloy jobs.'

'What's a *dissimilar* alloy?' says Goldie. 'You told me *all* alloys were made of dissimilar metals. Nicholas Rodder, you . . .'

I stop listening right there. I just stand at the bottom of the stairs and wait for Goldie to stop yelling. And I think of what I'm going to write about the Inco-Rod "A" electrodes.

The first thing is that the Inco-Rod "A" electrode welds all sorts of dissimilar alloys. Of course, it won't answer every welding problem. But it gives sound welds between low alloy steels and stainless and mild steels, and high-nickel alloys.

The research boys got good welds on a whole bunch of different alloy combinations using the Inco-Rod "A" electrode. And it will work with lots of other combinations. How many? Can't tell yet — we've only scratched the surface in finding out what it can do.

By the way, remember the new "132"* electrode I told you about a coupla months ago? Well, I slipped up on one thing: I should have said to use the Inco-Rod "A" electrode for welding Incoloy* iron-nickel-chromium alloy.

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Goldie's still going strong so I keep on thinking — to myself. 'Here are some of the things the fellers will like. *One,* it's easy to use in all positions with a spray-type arc and easy slag removal. *Two,* it's dependable — gives X-ray quality welds. *Three,* it comes in convenient sizes — 14 inch lengths in 4-diameters, 3/32- with center grip and 1/8-, 5/32-, and 3/16-inch with end grip.'

'You know,' Goldie shouts, 'I don't even think there *is* an Inco-Rod "A" electrode.'

So I pull the package of electrodes outa my pocket and charge up the stairs.

'*Four,* Inco-Rod "A" has a distinctive green flux coating to prevent mix-ups with other electrodes. You see? Green! Like you shouldn't turn outa jealousy!'

Now Goldie is willing to admit that the Inco-Rod "A" electrode isn't a redhead. Even if it isn't, it will still do a lot for you fellers. Write me for the new folder. That will give you a real good idea of the jobs it can do.

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Yours for better welds,

Nick Rodder

THE INTERNATIONAL NICKEL COMPANY, INC.
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PULLMAN-STANDARD . . .

tinued research will help us to accomplish that job.

Generally speaking, it is the writer's opinion that the railroad carbuilding industry is on the threshold of another big step in the transition from riveted to welded construction.

Past mistakes in welding have occurred chiefly because important factors were not given proper consideration. These are, (1) proper positioning of the work to place and hold the weld metal where it is desired and thus give operators a better chance to produce good welds. (2) following a sequence of welding that will avoid trapping and concentrating stresses in corners where failures can originate. (3) proper starting and finishing of welds to avoid notch effects, crossing welds and welding out to edges of plates and structural members. (4) failure to adjust openings and heats to obtain proper penetration and root conditions. (5) the design of joints for welding so as to achieve flexibility characteristic of riveted joints.

Experience has taught us that these factors cannot be overlooked or minimized. More education is needed to avoid repeating these mistakes in the future.

We believe that the welding industry, the suppliers of welding equipment and materials, can further the interests of welding by carrying on a simple education campaign outlining the importance of these factors.

What Is Needed For Future

For the future, then, we believe the welding industry needs better A.C. transformer type machines, with satisfactory controls, for automatic welding. These machines

(Continued on Page 95)

THE FUTURE FOR WELDING at Dominion Bridge Co., Ltd.

by G. F. W. BARRETT, P. E.
Plant Welding Engineer
Dominion Bridge Co., Ltd.
Lachine, Quebec, Canada

ALTHOUGH the development and use of welding has made considerable progress in heavy metal fabrication during the last twenty-five years, there are increasing indications that the future will see a continuation and acceleration of this trend.

As with other well established steel fabricators, the Dominion Bridge Company's development of welding has been methodical and deliberate. In the early days of welding, with plants and personnel equipped to handle other methods of metal joining, primarily riveting, there was no need to rush into this field with untried methods. However, the advantages of welding were recognized, and whenever its economy and safety were proven, it was used. Many of the first welded units were substitutes for castings and forgings. In applications such as these, plates and structural sections could be built-up into complex shapes which competed favourably with other methods of construction.

These first welded units uncovered many facts about welded construction and resulted in a company policy of controlled welding sequences, procedures and quality, all of which are necessary for economical, efficient use of the process.

As a result of this, and the long experience which has been acquired, welding has become one of the most important factors in the design and fabrication of the Company's products. *Without welding today no company in heavy metal fabrication can compete.* In pressure vessel and platework fabrication the great majority of work is welded.

Welding Is Economical

In heavy machinery, welding is often utilized for economy. In structural applications, the efficiency possible in design (with considerable savings in some type of structures) makes welding more attractive daily.

It is impossible to estimate the savings that welding has brought about in this industry. Savings-as

Welded construction makes possible smooth, clean lines of this bridge, world's longest continuous girder bridge at the time of its construction.

such-seldom mean much to a fabricator because competition soon forces the savings to be passed along to the customer and ultimate user. Of more importance is the fact that a great many items are built today which would not be possible without welding. A typical example is the pressure vessel recently completed for a customer This 120 ton Tower was fabricated of clad steel, a type of construction of increasing importance to the chemical, petroleum and paper industries. Without welding, a corrosion resistant interior on vessels such as this would be completely impractical.

Welding Sometimes A Must

The efficient use of material on heavy structures is simplified by proper use of welding. The loading girder illustrated was built for the U.S. Air Force heavy press programs. Some of the sections used were over seven inches thick and to join them by any other means would have been extremely inefficient, if not impossible.

The design of bridges lends itself well to welding. The bridge shown illustrates the smooth clean lines possible. This bridge, at St. Rose, Quebec, was the world's longest continuous girder bridge at the time of its construction.

The production of items such as these involves a considerable proportion of the Dominion Bridge Company's operations. In the structural field, however, riveted construction is still used for a large part of the work, although much of the small detail is welded. The reason for this is that the heavy, complex and efficient equipment that exists in the shops makes it possible to produce this type of work as economicaly as if it were welded.

What Is Welding's Future?

Introduction of the commercial coated welding electrode, and the development of the submerged arc process sparked the initial revolution which resulted in welding's

Second Welding Evolution Is Taking Place

prominence today. A second evolution is now taking place which will result in the obsolescence of many of today's practices.

In the field of hand welding, the introduction of metallic powders into the electrode coatings has already brought about considerable increases in production rates. These electrodes are still in development stages and in time will, without doubt, progress far beyond their present level of performance.

While manual welding with individual electrodes is used in the majority of today's applications, the search for a tool which will weld continuously by hand is being pressed. The inefficiencies resulting from the necessity of changing electrodes have been a major factor in welding costs, and several processes are now available which endeavour to overcome this. These processes would ideally have

(a) All position useability,
(b) Adaptability to most commercially available materials and
(c) High production rates

The manual submerged arc process led in this field, but it is limited to position and visibility. Other processes such as the inert-gas shielded arc, flux cored electrodes and flux coated electrodes are currently available, but high material costs and the early stage of development have not yet proved them to be economical or entirely feasible for general application.

Inert Arc Has Possibilities

The inert gas process seems, at this time to offer the greatest possibilities for the future. The development of carbon dioxide as the shielding gas for mild steel will lower gas costs considerably below those now resulting from the use of argon and helium. Several groups are also working on the development of low cost emissive agents to be fed into the arc to promote arc stability and some measure of chemistry control.

The relative complexity of semi-automatic equipment, especially the inert gas metal arc equipment has been a determent to its general acceptance. Introduction of the constant voltage power source eliminates part of this complexity, but the need for water cooling greatly affects the portability of the equipment. It is hoped that some means will be developed to eliminate this water cooling requirement. When these features become commercially possible it is probable that the inert gas process will become the most generally accepted welding tool in use in the steel fabricating industry.

Full Automatic Welding Changes

The field of fully automatic welding is undergoing considerable change at present. Whereas emphasis has been placed in the past on the use of very high current and deep penetrating welds, multiple layer thin pass welds are favoured more for heavy, quality welding today. This has resulted in equipment capable of high speed welding with one or more electrodes. At present submerged arc welding leads in this field, but if the beforementioned changes are developed in the inert gas process, it will probably encroach heavily into this type of work.

Resistance welding, while being used extensively in the light metal and mass production industries has not yet made too great an impression on heavy metal and structural

Seven-inch sections in this loading girder for U. S. Army heavy press program could not have been joined other than by welding.

(buildings etc.) work. In some respects this is surprising since it would seem to be a logical step from a rivet to a spot weld, using similar types of details. The reasons for this lack of development are quite obvious however, when the factors involved are considered. The extremely large power sources needed, the cleanliness of material for satisfactory operation the inability to visually determine weld quality and the large variation in type of work to be done in a structural plant all have been determents to its use. However, some phases of structural work are being done by this method and it is possible that the future will see a considerably greater use being made of the resistance welding process in heavy industry.

Consider Material Welded

In considering welding's place in industry, the welding tools, the machines and electrodes are most commonly considered. From a general engineering point of view, the type of material to be welded and its properties in service are often of much greater importance than the costs involved in welding. The failures involved in ships and other structures have initiated considerable research into this subject and some new material specifications have resulted. Considerable emphasis has also been placed on alloy steels with good weldability and physical properties. In the continued use of welding, and in the search for more economical, safe designs it is the material choice which is going to play an important role, probably a more important role than the method by which the welding is done.

Companies such as the Dominion Bridge Company are today relying on the use of welding for a large percentage of their production but there are many applications which are yet to be made. The development of more economical processes and more metals designed specifically for the use of welding will increase welded use considerably beyond its present level.

ANNOUNCING

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A NEW LINE

of automatic WELDERS and POWER SOURCES for submerged-arc welding

LINCOLNWELD now gives you

- AC or DC welding current
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PLUS

Choice of Cold Starts or Hot Starts

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Variable inching speed to or away from work

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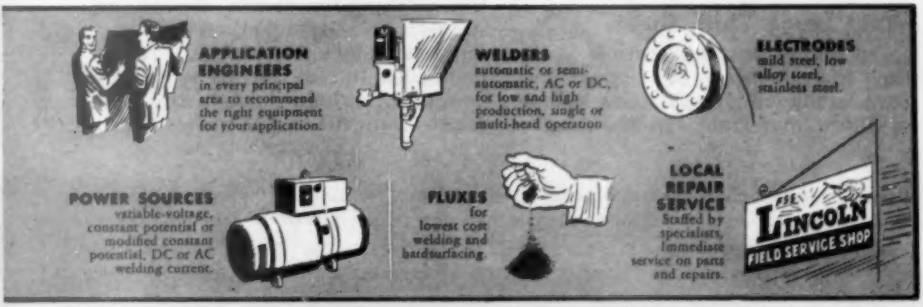
APPLICATION ENGINEERS
in every principal area to recommend the right equipment for your application.
WELDERS
automatic or semi-automatic, AC or DC, for low and high production, single or multi-head operation
ELECTRODES
mild steel, low alloy steel, stainless steel.
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variable-voltage, constant potential or modified constant potential, DC or AC welding current.
FLUXES
for lowest cost welding and hardsurfacing.
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Staffed by specialists. Immediate service on parts and repairs.
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The World's Largest Manufacturer of Arc Welding Equipment

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THE FUTURE FOR WELDING

HIGH performance aircraft of the future, whose structure will be heated by high speed flight, will require the use of high temperature resistant materials, such as precipitation hardening, corrosion-resistant steels and titanium. Since the temperature range will be above that for which metal adhesives are suitable, welding and brazing will undoubtedly play a large part in the fabrication of the airframe.

Weld Large Thin, Sheets

An important application is in the manufacture of honeycomb core sandwich panels using either of these materials. In the larger aircraft thin sheets available from rolling mills are too narrow for the best structural efficiency. But welding these sheets together to form larger sheets is indicated if it can be performed satisfactorily to give adequate aerodynamic smoothness and if adequate strength and ductility can be obtained in the welded joints. Resistance welding of faces of these sandwiches to honeycomb core would also be desirable because the welding operation should be simpler and lighter than brazing. Sandwich face sheets will range from .005 to .125 inches in thickness and the honey-comb core will range from .001 to .015 inches thick.

Brazed stainless steel sandwich panel developed at Convair—Fort Worth is shown in cutaway section below. Inner surface of same panel is shown in exterior view at right.

AT CONVAIR AIRCRAFT

by L. H. MOFFAT, Chief Design Engineer, Convair Division (Fort Worth)

Welded titanium and precipitation hardening, corrosion-resistant steels will also be used for the internal structure in such applications as the attachment of spar flanges to web members, the fabrication of miscellaneous trusses, etc.

Develop Materials And Equipment

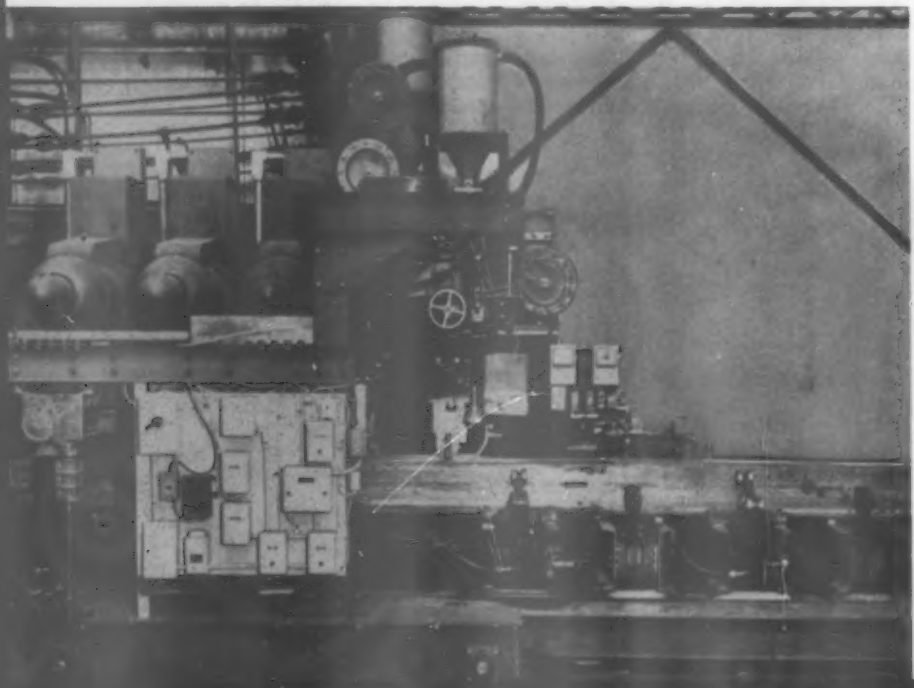
We feel that the use of welding will increase if materials and equipment are developed which will improve properties of welded joints. This should include base materials which are more weldable, as well as more suitable welding rods. We believe that atmosphere protected, consumable electrode welding can be refined further. Better equipment and procedures should be developed for the hand welding of titanium and its alloys. In the field of alloy steels, better weld efficiencies are desirable in the high heat treat ranges. Joint efficiencies of practically 100 percent can now be obtained in structures heat treated to the 180 to 200,000 PSI range. It is probable that efficiencies approaching this figure can be obtained in the ranges of 200 to 300,000 if better welding rods and improved techniques are developed.

THE FUTURE FOR WELDING

AS carbuilders to America's railroads, the American Car and Foundry Division of ACF Industries, Incorporated, is an extensive user of welding in the construction of freight and passenger cars.

All methods of fusion welding are presently used with the various shielded electric arc processes covering, by far, the widest range of applications. We are constantly seeking new and improved welding

Automatic welding gantry, which fabricates Z-bar center sills of freight cars, uses three wires, 2400 amperes and speeds up to 80 ipm. Open butt joint on 19/32-inch material was made in one pass. Deposition rate was 88 lbs. per hour. Welding wire and flux are shown in close up of welding jaws (right). Front jaws can be rotated during welding to provide for variations in fit up.



at American Car and Foundry

by WILLIAM H. SCHUSTER
Supervisor-Welding
American Car and Foundry Div.,
ACF Industries, Inc.

methods which will improve quality and lower costs.

High Currents—Smaller Wires

The present trend is in the direction of automatic and semi-automatic shielded arc processes with much higher currents and smaller wire sizes, and with the use of two or more arcs operating simultaneously within the same arc shield. The rapid progress made in the past half a dozen years in this respect leads one to believe that even the latest improvement in the manual electrode field, the introduction of the iron powder electrodes, will soon be made obsolete through the rapidly developing use of automatically fed, gas shielded wire for many applications now being performed manually with stick electrodes.

Challenge Welding Research

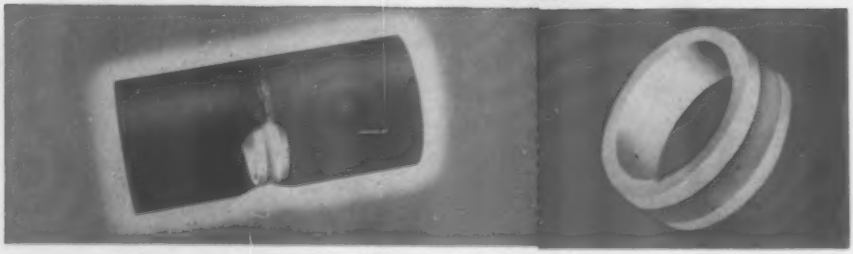
America's highly competitive business world is applying constant pressure for better, faster, and less costly methods of joining metals. The challenge to our welding research and development engineers will undoubtedly be answered. We should not, however, fail to keep our eyes open and to keep abreast with the welding development work being done by our friendly competitors across the seas.

Better pipewelds

with new **CERAMIC**

BACKING RINGS

IMPROVE WELD QUALITY
SPEED WELDING PRODUCTION
REQUIRE LESS SKILL
EASILY REMOVED WHEN WELD IS COMPLETED
ADAPTABLE FOR FIELD OR SHOP ERECTION
WITHSTAND ROUGH HANDLING



PYROTONE Ceramic Backing Rings, "heat engineered" to withstand high arc temperatures, insure proper root fusion. They reduce "test failures," speed welding operations, lower the cost of fabrication, and are completely and easily removable from pipe.

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THE FUTURE FOR WELDING at Studebaker-Packard

by A. H. RERICK
Welding Engineer
Studebaker-Packard Corp.

Basically, the automobile of today is what it is because of the great use of welding in some form: straight and multiple spot welding, projection and roll seam welding and copper brazing.

Fit Method to the Job

All of the mentioned means of joining metals are employed at Studebaker-Packard. The fitting of "method to job" is vital and should never be considered in a haphazard manner; in many cases our engineering division through cooperative planning with the production division, have brought about vast saving through deliberate designing away from heavy castings or forgings into pressed or formed steel stamping assemblies, created into a unit by welding.

Place for Resistance Welding

Each type of resistance welding has its place fairly well set at this present time. For single spotwelds, the press-type welder has been a good answer for years, but sheet metal assemblies to be welded in this manner must in general be moved, manually, from a bench to the welder. This method obviously has drawbacks, mainly fixture weight and handling time. In contrast, the portable welding gun can be used very advantageously to weld large or small sheet metal assemblies through use of stationary, and reasonably heavy, fixtures in which case weight of fixtures is not an item.

Projection welding is also successfully used here to make welded assemblies when a quantity of welds are to be done in a small area and especially in heavy sectioned assemblies.

Portable Roll Spot Welder

Finally, we must consider the portable roll spot welder. Of the various types of excellent welding equipment on the market this has the greatest possibilities for expanded use in the building of automobile bodies. With this type of

equipment, the many mating surfaces on the body can now be roll spot welded, stopping all potential water leaks, which have been a problem to the body builder for years. Like welding a gas tank, the seam welder on the body can be used most successfully to make a leak proof joint.

Typical examples of roll welding are the assembly of automobile roof panel and drip molding to the body proper and in trunk opening flanges. Much intensified use of this method of welding is in the future planning and designing of Studebaker-Packard components.

Copper Brazing Applications

Copper brazing is confined to that type of assembly—several or more parts—that will retain shape and relative location of one piece to another while passing through the heat zone. Experience is quickly gained through trial on this phase of work; once settled, great savings can be made. At the Studebaker Division, a group of one 8-inch, one 12-inch and one 18-inch continuous belt copper

(Continued on Page 99)

THE FUTURE FOR WELDING at Caterpillar Tractor Co.

by J. T. KINNEY
Welding Engineer
Caterpillar Tractor Co.

The needs of industry are many for tomorrow's welding problems, however, allied equipment must also be geared to move with it. We at Caterpillar see an immediate need for improved portable weld inspection equipment.

Today's production requires the development of a portable, compact fluoroscope X-ray unit to permit economical and rapid optional visual or photographic 100% inspection of critical weldments. This unit should produce a sharp clear 8" x 10" picture. With the development of radioactive isotopes to produce X-ray without any requirement for external power, we believe that portable equipment of sufficient intensity to penetrate 6 inches of material is practical.

Equipment of this type would eliminate destructive testing of weldments, the transportation of heavy weldments to central X-ray laboratory, development of negatives and would speed up our inspection of weldments and improve inspection methods. The expected use of the optional methods would be approximately 90% visual inspection and 10% use of the photographic process. Quick photographic reproduction should be similar to the land method to keep up with production flow.

Cuts down "DRAG"... cuts operator fatigue

NO MORE ENERGY WASTED on handling heavier, less flexible welding cables.

EXCLUSIVE! U. S. Royal Gold's unique yellow jacket of 60% natural rubber provides unbeatable visibility, reduces the hazard of accident which is present with black cable. Also, the yellow jacket provides an excellent contrasting color to black for conductor identification when two cables are required on welding machines.

COOLER TO HANDLE! The unusual *fluted* jacket provides greater surface area and thereby dissipates heat faster.

SUPERIOR IMPACT RESISTANCE! Proved by tests to be greater than that of conventional constructions.

LONGER LIFE! The greater flexibility of U. S. Royal Gold means greater dependability at terminal connections, minimum maintenance. Higher visibility of yellow jacket reduces danger of accidental damage, adds more life to cable.

GREATER MOISTURE RESISTANCE! That's because of the special 60% natural rubber insulation. Added protection is provided by the jacket, also of 60% natural rubber! Get U. S. Royal Gold at electrical supply houses.

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THE FUTURE FOR RESISTANCE WELDING

by J. C. WILSON, JR., Pres.
Resistance Welder Mfrs. Assoc.

MANUFACTURERS of resistance welding machinery look for continued growth in the application and utilization of their engineering services, welding processes and welding machinery in the next 10 years. Everyone agrees that automation of all welding processes, as well as other manufacturing processes, will proceed at a faster pace in the year immediately ahead. The higher costs of labor man hours, combined with the competitive motive which gains impetus in a peacetime economy, give automation of manufacturing processes added significance.

Resistance welding processes are inherently adaptable to automatic operation.

Increased Automation

We look for utilization of resistance welding processes in new manufacturing activities where they have not yet been employed; but we believe even greater growth in our industry in the next 10 years may derive from the application of higher degrees of automation to the many and diversified manufacturing activities which resistance welding processes already serve.

Careful Technical Application

Resistance welding machinery cannot be mass produced and distributed as can many other types of production equipment. It must be sold by careful technical application; machinery must be developed carefully to meet each specific production requirement and installed in production lines for practicable continuous production operation.

Technical know-how and experience in welding enginering and

machine design are and will continue to be at a premium.

Promote Needed Procedures

Recognizing their opportunity for growth and their inherent technical problems, and desiring to project such growth on the soundest possible foundations, manufacturers of resistance welding machinery are currently expending considerable effort individually and through their Association to actively develop and promote long needed procedures, policies, education, etc., which will enable them to better serve their market.

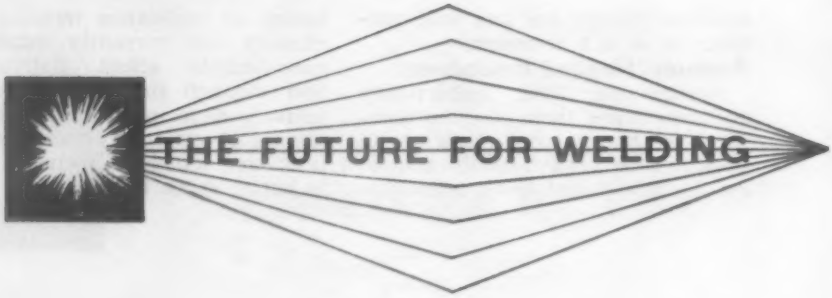
THE FUTURE FOR WELDING at Dodge Div., Chrysler Corp.

by M. C. PATTERSON,
Vice President in Charge of Manufacturing,
Dodge Division, Chrysler Corp.

PRIMARILY, our present thinking concerning the future use of welding is to integrate into our welding processes automatic control such as is used in the machine industry. That is, for example, to set up Automotive Body-Sub-Assemblies so that loading positioning, welding and ejecting of subassemblies will be done automatically. This trend of welding operations, although not a direct welding problem, brings up the need for automatic weld quality sensing devices for resistance welding that will show bad welds right after they are made.

There is also considerable need for extensive improvement in the field of shielded arc welding, not only to decrease cost, but to improve methods of operations.

Also, it would be very desirable if a useable method of indirect spot welding with one electrode and without back up blocks could be devised.



THE current upward trend in the use of welding may be expected to continue in the future. The expansion will be due to new applications of welding to products made of the well-known structural materials as well as to development of suitable welding procedures for some of the new metals in the industrial field.

For welding the new materials the important problem is to find methods of making satisfactory joints. Cost is generally secondary since these materials are expensive and welding cost is a minor factor.

On the other hand, for welding the common structural materials, cost is a very important factor. Both cost of welding and cost of suitable materials determine the extent to which welding is used. There are several developments in progress which are promising from the cost reduction standpoint.

How To Reduce Costs

In some cases cost is reduced by an improvement in quality of weld metal produced by a cheap process which will permit substitution of this process for a more expensive one for high quality work. For example, coated electrodes of the iron powder type decrease cost by increasing welding speed but their use is limited because quality of weld metal produced by them is not up to standards required for some types of work. Further improvements in electrodes of this type will allow their use on higher quality products and will thus reduce welding costs.

Low-Hydrogen Electrodes

The available low-hydrogen electrodes produce welds having excellent properties and also greatly facilitate welding of many hard-to-weld steels. However, low-hydrogen electrodes are more costly and, because of their operating characteristics, are slower than other types of low-carbon steel electrodes. Consequently, welds made with low-hydrogen electrodes are relatively expensive. Further developments to reduce cost and improve operating characteristics of low-hydrogen electrodes are desirable.

Use CO_2 Shielding Gas

Several current developments in the gas-shielded consumable electrode process indicate reductions in welding costs for various applications. With inert gases for shielding, the process is used for welding high alloy steels and many of the non-ferrous materials in spite of the high cost of shielding gases. Even for fabrication of some mild steel weldments, the inert-gas pro-

at Allis-Chalmers Mfg. Co.

by LOUIS J. LARSON
Consulting Engr., Welding
Allis-Chalmers Mfg. Company

cess is cheaper than conventional arc welding because the saving in welding time with the former more than compensates for cost of the shielding gas. However, for normal applications, use of the inert-gas shielding process is too expensive and recent developments using CO_2 as a shielding gas for welding mild steel are particularly attractive. The cost of CO_2 gas is only a fraction of the cost of inert gases. When suitable electrode wire compositions are developed for different types of welds in mild steel with CO_2 shielding, this process should be economical for many mild steel weldments.

Cost of Shielding Gas Can Be Reduced Considerably

Also in the welding of stainless steel, recent developments indicate that the cost of shielding gas can be considerably reduced. A special type of welding head, designed so as to furnish an inner shield or sleeve of inert gas surrounded by an outer shield of carbon dioxide, appears to produce satisfactory stainless steel welds with about one-third the amount of inert gas normally used. Further development of the process and tests of welds to determine their mechanical and corrosion-resistant properties are necessary before this process can be evaluated.

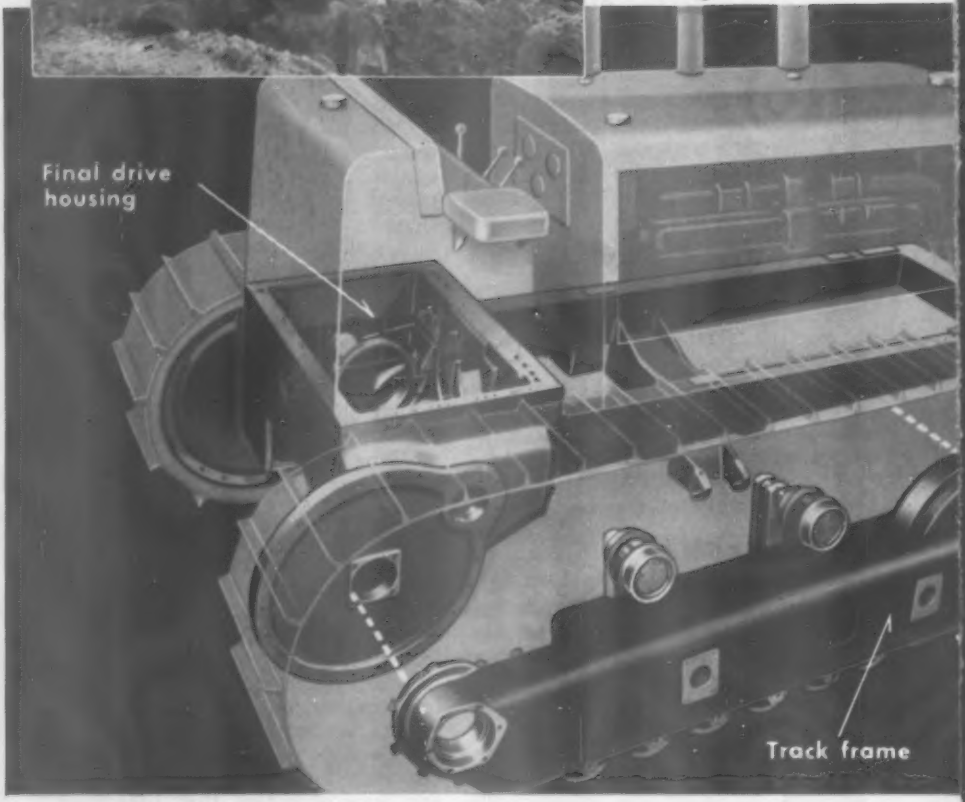
Need Low Priced Steels

Of importance to the welding industry but not within its direct control is the development of low-priced steels which are not embrittled by the usual manufacturing and welding operations. The common types of mild steel are satisfactory for welded structures which can be stress-relieved, but when stress-relieving is impractical, welding is sometimes prohibited. There are low alloy steels which show no indication of embrittlement due to fabricating and welding processes but these steels are too expensive for general use.

Need Data On Weld Metals

Manufacturers of welded equipment would benefit by the publication of more data on the notch toughness and transition temperature of weld metals. A mass of information on the toughness of steels, under various conditions, has been published in recent years but very few data on weld metals are available in the literature. Some test results which are available indicate a wide difference in notch toughness of various types of welds. Additional data on this subject are needed so the engineer can design his structures more intelligently and with greater confidence.

Here, welds push,



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INTERNATIONAL TD-24 DIESEL CRAWLER

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A. O. Smith SW-12 (AWS E-6012) electrodes account for more than half of over 600 lbs. of weld-rod used in each TD-24.

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The man from A. O. Smith . . . Owen Lundgreen is the representative who helped International Harvester select SW-12 electrodes for the TD-24. Not just an electrode salesman—but a real welding consultant—your man from A. O. Smith is always available to help solve your welding problems.

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THE FUTURE FOR WELDING

DURING the period from 1920 to 1952, production of electrical power in this country rose from 40 billion kilowatt hours to 400 billion kilowatt hours. This growth becomes even more remarkable when we consider, that according to best predictions available to us, it is reasonable to expect total power production to double within the next ten years. Welding has played a very large part in making the growth of electrical power production in this country a reality. The design and fabrication of large power installations would be inconceivable today without welding as a means of fabrication.

Why Welding Use Increased

This greatly increased use of welding, which had to occur along with the advance in design of power plant equipment, took place in two directions. First in the field of welding equipment and filler metals to permit deposition of sound

New automatic submerged arc welding process developed by Babcox and Wilcox Research Center is said to deposit metal up to five times as fast as comparable methods, and at half the power cost.

at Babcock & Wilcox Co.

by N. C. JESSEN
Asst. Superintendent
Barberton Works

weld metal, and secondly in the development of the metallurgy of welding to produce metals adequate for the service intended. Early in 1920, welding on power boiler installations was at best a rare occurrence; in 1952, the total usage of welding in our various shops and in the field involved some one half million pounds of weld metal per month. When we consider that this same industry in which welding has grown to such an extent in the last 25 years, is expected to double again in the next ten years, it is reasonable to assume that a considerable amount of further development work will have to take place to meet the demands of the future.

Need Quality Weld Metal

Welding, in the power boiler industry, demands the highest possible degree of weld metal quality and soundness. In order to achieve sound welding and assure the necessary level of quality, with a high degree of predictable performance in service, we have placed a large number of mandatory inspection requirements and restrictions on welding. Many of the early code rules involving mandatory heat treatment, such as stress relieving, non-destructive testing, hydrostatic testing, etc., have been useful and necessary for many years and have been a direct result of the early troubles experienced with welding. On the other hand, the ability to produce welds in production—of predictable quality — has been increasing steadily over the years and will continue to increase. Along with this increase in quality, it is then reasonable to look for re-consideration and re-evaluation of the restrictive rules which today effect the economy of welding to a considerable degree.

Future For Welding

To appreciate what the future may hold for manual and automatic arc welding, it is interesting to consider the development in materials used in power boiler construction over the last 25 years. In the fabrication of pressure vessels, we were at one time limited to steels of 55,000 and 60,000 psi minimum tensile strength. For the past ten years, the standard steel for pressure vessel construction in the power industry has been a 70,000 psi tensile steel. Moreover, the safety factor used in design permits the use of 25% of the tensile strength today, where previously a safety factor of 20% was used. In recent years a considerable amount of work has been done in power boiler construction using an 80,000 psi minimum tensile steel for the base metal. The 80,000 psi tensile

"There is no doubt that automatic welding processes have offered the greatest economic inducement to industry and will continue to play an important role in the application of welding. In the power boiler industry, the application of automatic welding has accounted for some 10% of the total welding in our various Works and erection activities. It is to be expected that the development of better machines, standardization of design, etc., will permit a more effective application of automatic and semi-automatic processes in the future."

steel with thicknesses up to six inches is becoming a rather standard item in our shops today. Beyond that a vessel was manufactured in our shops some time ago of steel having an ultimate tensile strength of 110,000 psi with a minimum yield strength of 80,000 psi. Another significant departure from conventional design was the fact that this vessel which had a wall thickness of six inches and a diameter of approximately six feet, was designed to a working stress of 32,000 psi.

Many years will pass before sufficient data and experience is available to permit application of such high design stresses and high tensile steels to conventional pressure vessel construction. There is no doubt, however, that the development of welding in this direction offers attractive economic advantages, and, further, that our ability to realize these advantages is strictly a matter of time and development work.

Electrode Development

In manual arc welding, we have already gone a long way when we consider the advances from original bare or sul-coated electrode, depositing weld metal of rather poor mechanical properties, to the highly refined low hydrogen electrode in use in our shops today. In this field of welding, we have to continue our development of new weld metals suitable for high temperature service and welding electrodes which will deposit welds of even more predictable quality in production. There is little doubt that the key to this problem lies in the more extended use of the lime coated type of rod and further work on the metallurgical factors controlling both quality and performance of weld metals.

The production of mechanically sound welding is today taken rather for granted and our problems in the future will be concerned to a far greater extent with the behavior of weld metal at the high service temperatures involved in power boiler application.

When considering the future of welding in power boiler fabrication, we should not ignore the fact that our ability to produce welds suitable for the service intended is to a large degree affected by quality of the base material which we are welding. In some welding processes more than others, base material melted in the process of welding constitutes a significant percentage of the weld metal.

"Welding Quality" Steel

Our friends in the steel industry, as well as those of us who are interested in the metallurgy of welding, are going to have to develop a better understanding of the meaning of "welding quality" steel. The open hearth furnace, as a producer of steel in large quantities, is a very

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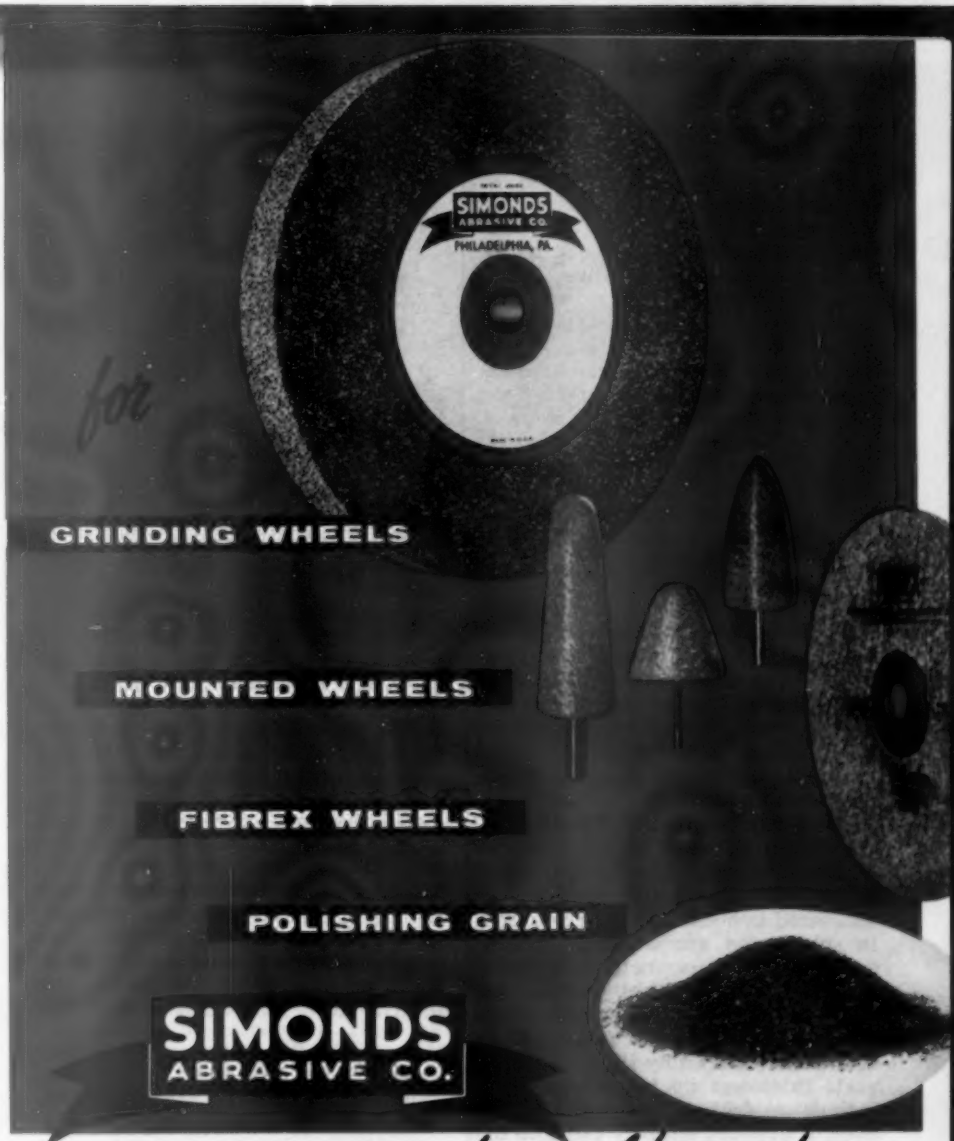

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highly desirable tool from an economic viewpoint. From a point of view of welding, steels produced in an open hearth furnace may have certain metallurgical disadvantages, and although great strides have been made in the direction of improving steel quality over the past years, there appears to be much work left to be done. Electric furnace quality steel based on experience, particularly in the field of low alloy steels, appear to have some advantages in this respect. There remains little doubt that future application of materials to pressure vessel construction will involve steels of high mechanical properties in order to realize the economic and design advantages possible with this type of material. However, before full advantage can be taken of this opportunity, we must learn to produce steel with a set of metallurgical characteristics which would make the production of welded structures of high strength materials a predictable and sound procedure.

Source for Increased Benefits

Perhaps the most significant advances in the past and, by the same token, the most likely source for increased benefits in the future lies in submerged arc welding. There are many factors, both metallurgical and mechanical, which at present limit our ability to utilize this process to full advantage. The economies offered by the process in plate thickness up to perhaps two inches are truly significant. However, it appears entirely possible to weld at much higher current levels and, therefore, permit the joining of five and six inch thick plates with one pass of weld metal for each side. Limitations which prevent the full realization of this possibility may be sought in a number of areas. First of all the plate

(Continued on Page 88)

THE AMSCO® HARDFACING LINE IS COMPLETE . . .

Hardfacing Rods and Electrodes . . . A complete line of manual and automatic build-up and hardfacing materials. One for every repair job. Amsco rods and electrodes contain alloys of the toughest, hardest metals known. Amsco manganese steel rods are also available.

Automatic Welders . . . The Amsco-Leader line of welders permits fully automatic build-up and hardfacing, especially in fields using heavy-duty equipment. Welding positioners and power unit included in package.

Amsco Repointers . . . Add the long wearing quality of manganese steel to digging equipment. All you do is weld them on. Available also are rounds, squares, flats, plate, grouser bars and electrodes—all made of manganese steel.

Semi-automatic MF Welder . . . Uses entirely new principle of magnetic flux welding that permits you to step up weld deposit rate, increase welding speed during hardfacing or build-up. Welders connect to any standard AC or DC welding machine.

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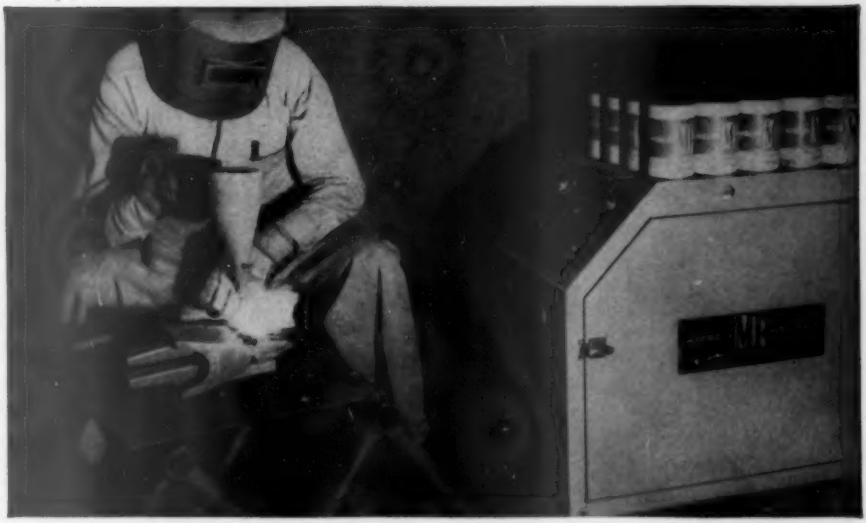

Welder is shown welding a "wear-sharp" repointer to the shank of a dipper tooth using the Amsco MF and flux.

HARDFACE WITH THE AMSCO® MF

for manual flexibility . . . plus machine speed and accuracy

The Amsco MF combines the visibility and craftsmanship of hand welding with the automatic advantages of machine work. Speed of hardfacing increases because the Amsco MF uses small-diameter electrode and high-current densities which allow the operator to maintain a high deposit rate. The electrode feed is continuous—and automatically regulated —to maintain a constant arc. Thus, the machine automatically *compensates* for operator movement or an irregular welding surface.

Cost of deposited metal is less! The Amsco MF uses coiled, bare mild steel electrode. It feeds through the flux hopper (the cone). There it is magnetically coated with your choice of manganese steel build-up or hardfacing alloy which is carried in the flux. You coat your electrode as you weld at considerable savings in deposit cost.

The machine is portable. It plugs into any standard welding unit, and requires no special setup. See a demonstration of the Amsco MF's speed, quality of weld and uniform deposit. Try it yourself and discover how easy it is to operate. Your Amsco Distributor is ready to show it to you now. Welding products are distributed in Canada by Canadian Liquid Air Co., Ltd.

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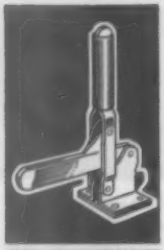

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metal presents some problems in so far as a rather large portion of the weld will be made up of parent metal. Secondly, the welding fluxes now in use are not considered suitable for welding at current levels of five and six thousand amps. and finally, a welding technique and equipment would have to be developed to permit welding at such current levels. Although the problems facing us in this area are considerable, there is no doubt that they will lend themselves to a solution in the future.

Most welding of heavy pressure vessels with the submerged arc welding process is done today by a system of multiple pass welding. Here, again, we visualize the development of techniques which will permit the deposition of weld metal at much higher rates than heretofore anticipated. These economic gains will be realized in the future in much the same way as the gains that have been shown in the past 25 years were achieved. Namely, by continued effort on the part of industry in the further development of our equipment and procedures of welding.

Applications for Inert Arc?

The most recent welding process, inert gas shielded arc welding has found relatively little application in the power boiler industry to date. The reason for our reluctance to adopt this process in production as a method of fabrication has been the fact that production of weld metal of predictable soundness has, up until now, been somewhat questionable. Considerable work is going on in our own laboratories and shops as well as in other plants and laboratories all over the country. It would appear to be a reasonable prediction that the inert gas shielded arc welding process will find a place in power

boiler fabrication and contribute, perhaps, more significantly than we now realize, to our ability to fabricate power boiler components more effectively and more economically.

Metallurgy of Arc Welding

The key to the rapid advances of welding over the past 25 years may be found in the increasing knowledge that has been developed in the field of welding metallurgy. This is no doubt entirely true in the case of high alloy steels in that sound welding quality is a direct function of the metallurgy of a weld deposit. It is true to a far greater extent than generally realized in the welding of carbon steels. Future developments in arc welding will be closely allied to a better understanding of the problems involved in welding metallurgy, and will be determined not so much by our ability to design and build better welding equipment, but rather by our ability to solve the problems involved in the metallurgy of arc welding. Although there is much to be learned in the years ahead, the future of welding in the power industry, from a point of increased usage as well as from a point of view of new developments, would today appear to be one of the brightest in the industry.

Bay State Names

Hugh J. McKane, Atlanta, Ga., has been promoted to District Manager of the southern area for the Bay State Abrasive Products Co., it was announced by Elden L. Auker, general sales manager. The post is a new one in the company and encompasses 12 Southern states.

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Weighs only 65 lbs.; carry it to the job!
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OBSOLETES ALL OTHER WELDERS OF COMPARABLE RATING!

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Bren-Weld handles electrodes from 3/64" through 5/32"; it has adjustable arc voltage for various arc characteristics.

Because it is so flexible in operation and application, Bren-Weld is ideal for plant production and maintenance, for construction work, for railroads, on the farm and in home workshop.

- 200 Amp.—At 50% Duty Cycle
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11" x 12" x 7½" LIST PRICE F.O.B., L. I. City $169.50

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America's most complete line of arc welding equipment and electrodes.

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Sizes up to 625 amps. All connectable to 220 or 440 volts—550 volts on request.

POSITIONERS
Capacities from 500 to 100,000 lbs. — remote-control and hand-operated models.

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The first machine to give you either AC or DC current at the flip of a switch.

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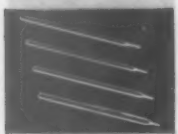
Four sizes—200, 300, 400, and 500 amps.



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. . . available in 500, 750, and 1200-amp. sizes to provide simplified operation; lower installation and power costs; for all automatic welding processes.

If you're looking for a way to cut your production welding costs, you can find it in this new P&H line of Constant-Voltage welders. Here's why:

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the P&H *Line*

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DIESEL ENGINES

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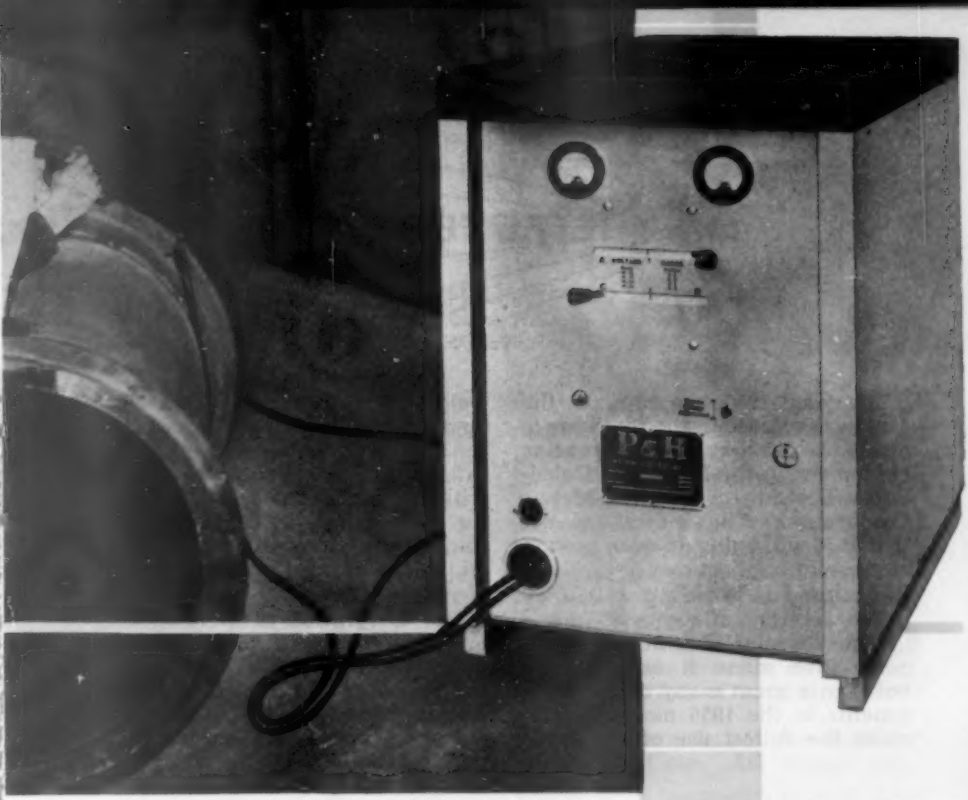

Welders

Lower installation and power costs — The high efficiency (85% or better without correction) of P&H CV welders offer you outstanding savings in installation wiring costs and operating power costs. For example, a 40-volt, 500-amp P&H unit has a rated 3-phase input of only 33 amps at 480 volts.

Only 35-amp switches and fuses are required. Several hundred dollars can be saved in power wiring alone as compared to that needed for conventional motor-generator or transformer-type welders of comparable capacity.

It is often possible to replace a 300-amp motor-generator set with a 1000-amp P&H unit without increasing power wiring or load.

Only these P&H Constant-Voltage welders have been job-proved on all these automatic welding processes — submerged arc, inert gas (MIG), semi-automatic, hard-surfacing, automatic stud welding, low-current density welding. Get all the facts by just sending in the coupon below.

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THE FUTURE FOR WELDING

The year 1955 has brought the greatest increase in the purchase of resistance welding and brazing equipment in the history of Delco-Remy Division of General Motors Corporation. The indications are that 1956 will bring an even greater number of applications.

Redesign For Welding

The pressure of competition and the increase in labor and material costs have made it necessary to redesign a great many of the components in the 1956 model cars to make the fullest use of resistance welding and brazing. The development work has been completed for some time and most new applications can now be incorporated without additional tool costs. A further decrease in the use of soft solder and rivets will produce parts which are better mechanically and electrically yet cost less to produce.

The integration of welding and brazing equipment into machines which perform other operations has tended to reduce use of special welding machines. Even though we are using more standard equip-

at Delco-Remy Div., G. M. C.

by J. RAYMOND WIRT
Chief Welding Engineer
Delco-Remy Div., GMC

ment, production requirements will still necessitate the use of special single purpose machines.

In the past 15 years we have had very good cooperation from manufacturers of resistance welding machines in producing the types of high production equipment essential to good production efficiency.

Develop "Production Machines"

The improvement in coordination between the manufacturer and ourselves has resulted in the following features which have largely resulted in the change in classification of welders from "machines" to "production machines".

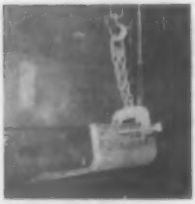
Ease of maintenance, essential in reducing down time, is often neglected by the manufacturer. When machines are placed in progressive production lines, and must produce 1800 or more parts per hour for each of the 16 hours per day, even a minute saved in down time means a saving of several dollars in labor.

Operator comfort is essential in reducing fatigue. All human be-

Automatic resistance welding machine (left) makes, places and welds two leads onto an electrical switch for automobiles. Concentration of resistance welding operations is shown on generator regulator assembly line (below).

PUT A HANDLE ON Heavy Weldments

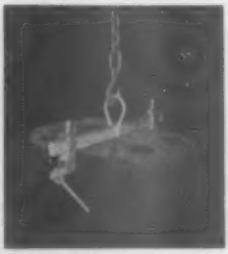
Gonser portable positioners improve lifting and positioning efficiency in three ways:



Heavy objects, like blocks and slabs—sheets and plates, are easily and safely handled by these rugged, lightweight positioners.

Hard-to-Handle shapes—pipe, machine assemblies and structural shapes—are no problem, either for Gonser Positioners.

Weldments and castings can be speedily positioned for welding and machining by this versatile positioning tool.



Inexpensive Gonser portable positioners cut handling time as much as 75%, become indispensable like vises, wrenches, hoists.

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ings have legs as well as arms and they must have some convenient place to put their feet—with sufficient freedom to move them occasionally — to reduce the strain which can be caused by sitting or standing in a cramped unnatural position. A natural position with balanced movement of both hands will help considerably to maintain the operator's output at a constant level during the day.

Components Are Reliable

Components, such as valves, jigs and fixtures, switches and controls, are reliable and interchangeable. The quality and workmanship on both basic machines and jigs and fixtures has increased tremendously as welder manufacturers have replaced the drill press and rasp with precision machine tools and trained personnel to use them properly. Constant pressure by users has brought results in better controls, switches and valves.

Force mechanisms have been improved. The old hit-or-miss type of bearing has been replaced with ball or roller bearing type heads which are capable of taking considerable load, even when the load is off center, and still give rapid and constant follow up characteristics.

Smaller Units Need Less Space

Welding machines have been reduced in size. Floor space is not plentiful in any busy plant today and, on assembly lines especially, the reduced physical dimensions of machines has resulted in more available space.

Timers have been improved so that non-synchronous types do a very good job on the majority of applications. In addition to being less expensive and less complicated, they are now being built with fail-safe features and transient suppression features which,

above 3 or 4 cycles weld time, make them more desirable than synchronous timers.

Gadgets Have Been Eliminated

The number of gadgets on welding machines has been reduced to essentials only. The day when it was necessary to use gadgetry as a sales stimulator has passed. There is a real need for properly applied welding operations.

The progress which has been made in the welding industry is a good indication of the future progress still to be made.

I am proud to be a part of such a progressive industry.

PULLMAN-STANDARD . . .

(Continued from Page 61)

should be unaffected by line voltage surges or at least be able to compensate for them. Too, the industry needs more versatile semi-automatic machines with either gas or flux shielding. And the automatic machines with proper built in controls to improve starts and stops.

A welded construction, when compared with riveted, usually has the benefits of lower cost, greater strength for given weight and the elimination of many lapped joints where corrosion can occur. Referring to this latter point particularly, the railroad industry needs a better understanding of the liabilities which are present in such joints.

In general, continuation of a program of welding education and research should go a long way in accomplishing progressive results for this great industry.

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demands the accuracy of a

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WELDING TABLE

Spot, arc, or heavy-duty welding! Challenge Semi-Steel Welding Tables stand up to **any job, in any plant.** Provide a true, rigid more convenient surface. T-Slot construction. In 3 standard sizes. Multiple units of special sizes may be mounted into one large unit.

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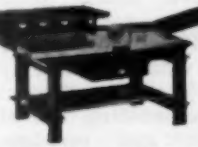

CHALLENGE also manufactures a complete line of auxiliary welding equipment including Cast-Iron Work Benches, (shown), Semi-Steel or Clovis-Black Granite Surface Plates, Checking Tables, Bench Plates and Adjustable Floor Plates.

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THE FUTURE FOR WELDING

by S. M. SPICE
Senior Welding Engineer
Buick Motor Div., G.M.C.

AT the present time in large automotive plants practically all production welding is performed in fully automatic welding machines whether it be by resistance or arc methods. The uses for resistance welding are still on the increase and resistance welder manufacturers are working at full capacity. These manufacturers are beginning to find themselves with strange (to them) bed fellows, i.e., combining of other operations such as automatic feeding; press operations that assemble press fits, form or coin, etc., sizing operations, and many others. Since most purchasers of machine tools of this nature like to buy a package from one company, this opens up a tremendously broadened field for resistance welder manufacturers. This same statement is true in the automatic arc welding machine field.

Automatic Submerged Arc Welding

The automatic arc welding processes are having a phenomenal growth for other reasons. For many years this field stayed relatively stagnant for lack of good fluxing and/or shielding means. With the advent of such means, and with an additional dividend of very much higher deposition rates and welding speeds, this method has become of great economic importance. The possibilities for the future are tremendous and the automotive industry is taking full advantage of them. Buick alone has doubled its use of automatic arc welding in the last year and will probably double it again in the next two or three years.

Some of this growth comes from increased strength demands placed upon chassis components such as axles, torque tubes, etc. These demands for increased strength are dictated by current increases in engine horsepower coupled with increases in acceleration torque from automatic transmissions.

Growing Importance of Automatic Gas Shielded Arc Welding

The advent of inert gas metal arc welding and carbon dioxide

AT BUICK MOTORS DIV., G. M. C.

gas metal arc welding has enlarged horizons for automatic arc welding. These two methods, with their attendant smaller filler wires using very high current densities and very high welding speeds, make possible both narrow deep penetrating welds and flat shallow welds, depending upon polarity and other factors. These properties are of great interest to automotive welding engineers and designers, and the future will find greatly expanded use of gas shielded arc welding. Certain economic and technical disadvantages which are currently slowing expanding usage will be overcome.

Automatic Arc vs. Resistance

Welding speeds are now such that actual welding cycles are the smallest part of the total operation, very much as it is in resistance welding. As a matter of fact, in many applications, automatic arc welding is competitive with resistance welding. These same high welding speeds greatly reduce distortion and heat band width to the point where finish machined and heat treated parts of fairly high precision may be welded together without going outside normal dimensional tolerances. High hardness areas closely adjacent to the weld are undamaged by the weld heat. In such parts the total heat affected zone adjacent to the weld may often be no more than $\frac{1}{16}$ inch in width.

The rapidly expanding use of transfer equipment to link machine tools together to make a complete machine lineup totally integrated, is just as easily applied to automatic arc welding machines as resistance welders. The same rules apply and the same difficulties are encountered. For designers of welding machines a whole new concept is required. The machines will be designed for, or built around a means of, moving the parts in and out of the machine in conjunction with integrated transfer systems. Moving parts in and out will be the first consideration and the welding means will be second, and subordinated to the first, even though welding is the major objective of the machine without loss of quality, consistency or productivity.

Mechanical Transfer System

Calculation of productivity will be much more accurate when mechanical transfer systems are used. However the welding data upon which machine design and productivity are based must be detailed and accurate so that there will be absolutely no doubt that the machine will integrate with previous and following operations in the total line up. Safety systems will be required to protect machine and transfer systems from damage when any failure or irregularity takes place, and these must indi-

cate at what point it occurred.

Since machines with integrated transfer systems will be, in many cases, much more hemmed in than now, accessibility of all mechanical components and control systems, and ease of maintenance, will be an absolute necessity. Designers of welding machines ignore this requirement all too often. Now, and in the future, they must pay strict attention to this all important requirement. Poor and expensive maintenance is one of the worst evils in the automotive industry today, and certainly the most neglected. In the future, maintenance personnel must be especially trained for the job. General Motors is particularly fortunate in having the facilities of General Motors Institute to call upon for such training. Particular attention must be paid to preventative maintenance and regular schedules must be set up and maintained. Welding machines of the future will be more complex than those of today because of the many additional functions they will perform. However, the economic advantage gained will be large and well worth while.

Quality Control in Various Welding Processes

Process control and inspection are no problem in automatic arc welding as compared to resistance welding. If an arc weld is poor it will readily be seen by simple visual inspection. Repairs are easily made, consequently little is lost in unsalvageable scrap. With resistance welding, visual inspection tells very little about the quality of weld obtained. Periodic destructive testing is required for the quality control of resistance welds. This is both costly and time consuming. When substandard quality work does occur, the rejected parts are much more difficult to repair, and very often arc welding is the method used for such repair. With automatic arc welding, if current, voltage and travel speed are maintained, then good penetration occurs and strength of bond is assured. In resistance welding it is not that simple.

In conclusion it may be said that while all forms of welding are continuing to grow at a good rate, automatic arc welding is the method to watch. Its growth will be rapid and will continue for a long time, not only because of its long slumber but also because of a fortunate combination of high strength requirements in present day and future automobiles, and the economic advantage of high speed operation.

AMERICAN WELDING SOCIETY . . .

(Continued from Page 52)

do not see a new or improved product or technique announced to add to the tools of our trade and the expertness of our craftsmen. As an example, we submit that low hydrogen type electrodes, with and without iron powder coating, have made rapid strides in recent years.

And with this pattern of progress behind us, plus the established position of welding as the preferred fabrication process in the limitless field of nuclear development, how can we help but conclude that the next 10 years will bring us along with even greater strides in this "golden age" of welding. However, rather than feel complacent let us remember there still are people in industry who need to be educated to the advantages of welding. This also is our task, yours and mine.

STUDEBAKER-PACKARD . . .

(Continued from Page 72)

brazing furnaces is in daily use. Where this method can be used, a brazing furnace, in full time operation, will usually pay for itself in three months time, over ordinary methods of assembling.

Questions for Manufacturers

From the point of view of a user of resistance welding equipment, why do manufacturers continue to use so much heavy bronze and copper in their portable equipment when a copper jumper and a frame of light metal would do the work? Why doesn't some water cooling equipment manufacturer make a small inexpensive cooler to recondition water after use in the welders, and stop using rivers of water everyday while keeping welding equipment cool?

POSITIONS AVAILABLE

WELDING ENGINEER

Expanding programs in welding, brazing and soldering have created an opening for a welding research engineer. This is an opportunity for diversified experience in joining. Salary commensurate with experience and training. Liberal employee benefits include generous tuition refunds for graduate study. Write:

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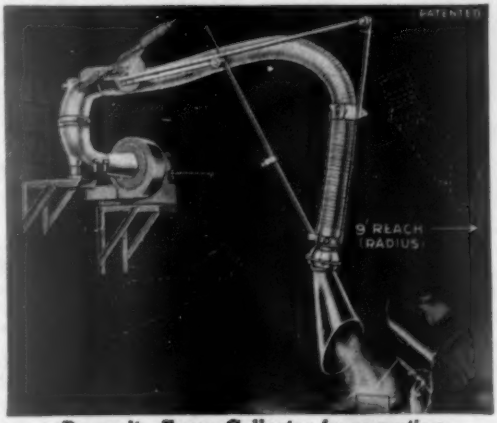

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Welding shops equipped with Ruemelin Fume Collectors are assured of a clean shop atmosphere. Noxious fumes, heat and smoke are eliminated AT THEIR SOURCE. Improves working conditions . . . lessens fatigue . . . paves the way for increased plant production. Especially helpful in winter months when windows and doors are closed. Note the new spring-loaded counterbalance mechanism which makes Fume Collectors much easier to handle. Ask for Bulletin 37-E illustrating this new feature.

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A: One big factor is the quality of the electrode used.

Q: How can you be sure of getting the best electrode?

A: By insisting on Alcoa's new I.G.* Electrode.

Q: Why?

A: Every production lot of Alcoa* I.G. Electrode is test welded and the welds X-rayed for soundness. Each 10-lb spool is individually packed to maintain the super-smooth finish to assure soundness of weld and smoothness of feed. Each of five alloys, 1100, 4043, 5154, 5254 and 5356 (formerly 2S, 43S, A54S, B54S and XC56S), is available in six diameters. There is no better electrode.

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Your guide to aluminum value

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A: Contact your nearest Alcoa sales office, or, for immediate delivery, call one of the Alcoa Distributors listed below. He carries a complete range of alloys and sizes, and you'll find him well qualified to work with your welding experts.

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Metal Goods Corp.

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Edgcomb Steel Co.

†Home Office

Circle No. 56 on Reader Service Card.

THE FUTURE FOR WELDING AT DRAVO CORPORATION

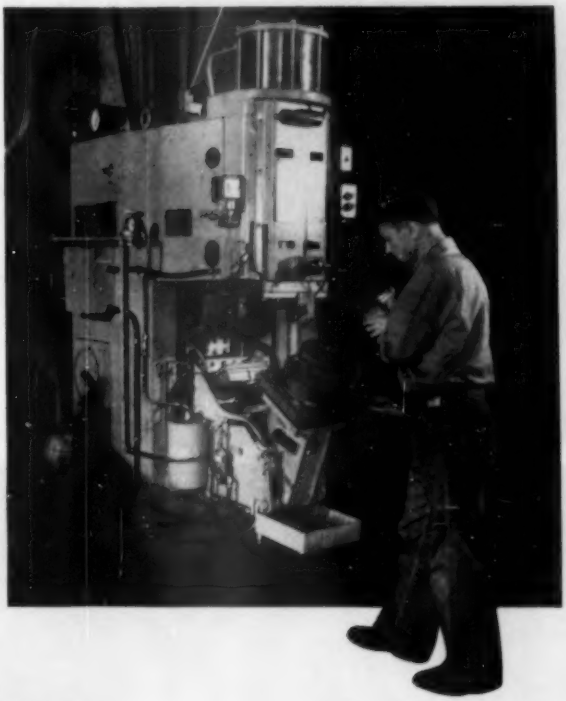
by D. H. MARLIN
Research Engineer
Drave Corporation

METAL fabricators whose design and operating economies are closely linked with welding are acutely aware of its ever-increasing usefulness and versatility. In recent years, we have all welcomed the rapid strides made in developing more weldable metals, better equipment, new processes and techniques for "difficult to weld metals," as well as a better understanding of fundamental metallurgical and mechanical factors which govern successful welding.

However, since the majority of present welding operations are essentially manual processes, it is readily evident that the "human element" is still a major factor in determining the overall quality and cost of welded fabrication. In order to effectively advance welding, it appears necessary to reduce this human element to a minimum. There is a definite need for better welding processes which are sufficiently portable, versatile and practical for use under ordinary shop or field conditions and which, in turn, do not impose too stringent requirements on fit up or surface preparation. Further developments in the use of resistance welding techniques for welding heavier structural shapes and plates seem profitable in view of the potential reduction of distortion and cost.

One of the greatest factors in furthering the present and future advancement of welding is to provide more and better education concerning operating fundamentals and limitations of presently available welding processes. This knowledge is needed at all levels within the industry. The designer and draftsman needs to know more about practical operating limitations of the various welding processes used with different metals. Similarly, operating personnel should have better knowledge of fundamental metallurgy and design requirements. Recognition of these basic principles by engineering and operating personnel results in better design, higher quality and more effective use of welding.

HOW FEDERAL HELPS BINGHAM-HERBRAND BUILD BETTER ASSEMBLIES



Before and after shots of a power unit case for appliance application. Fifteen separate parts are welded together to make a complete unit.

To maintain constant high quality, yet keep their prices competitive, Bingham-Herbrand, Toledo, O., must continually work at controlling costs.

It's this cost consciousness that has brought them to rely on Federal Resistance Welders. Their records show they get more production at less cost from Federal equipment.

Bingham-Herbrand is not alone in this respect . . . for wherever resistance welding units are a major operation and costs are important, you'll find machines by *Federal—First in Resistance Welding.*

Federal® WELDERS

Warco® PRESSES

THE FEDERAL MACHINE AND WELDER CO.

WARREN, OHIO

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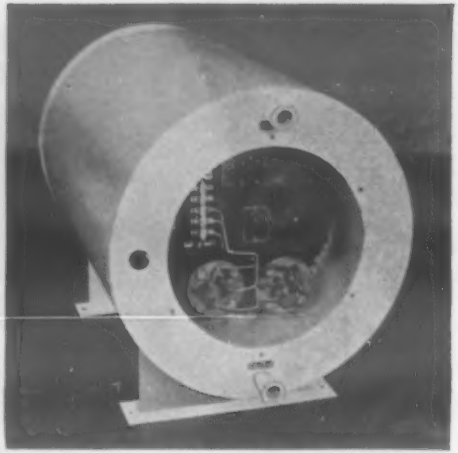

ABOVE: A completed Hubbell booster water heater.

LEFT: Welding the head on a 10-gallon Everdur booster heater tank using Anaconda ⅛" Everdur-1010 Rod. All spuds, flanges and fittings are Everdur.

Everdur tanks...welded with Everdur-1010 rod make long-life booster water heaters

Water at 180F may be highly corrosive. Yet 180-degree rinse water is required by many sanitary codes for sterilization in commercial dishwashing machines.

of Everdur* for its tanks.

The tinned Everdur tanks for booster heaters are welded by the carbon-arc method, using Everdur-1010

tor for help in selecting the exact rod to help you speed assembly and cut production costs. Or write for Publication B-13. Address The American Brass

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The Electric Water Heater Co. of Stratford, Conn., makers of Hubbell water heaters, and one of the pioneers in the electric water heater business, builds 10-gallon and 20-gallon models for just this service. Experts in the design and fabrication of water heating equipment, Electric Water Heater Company is also a pioneer in the use Welding Rod. In this tough service in restaurants, hotels, schools and institutions, the tanks have performed dependably and are considered to have a long life expectancy.

AnacondA Welding Rods for many types of welding are available from distributors throughout the United States and Canada. See your distributor, Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

*Reg. U. S. Pat. Off. 55125

braze or weld with confidence

ANACONDA®

welding rods

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You can select from

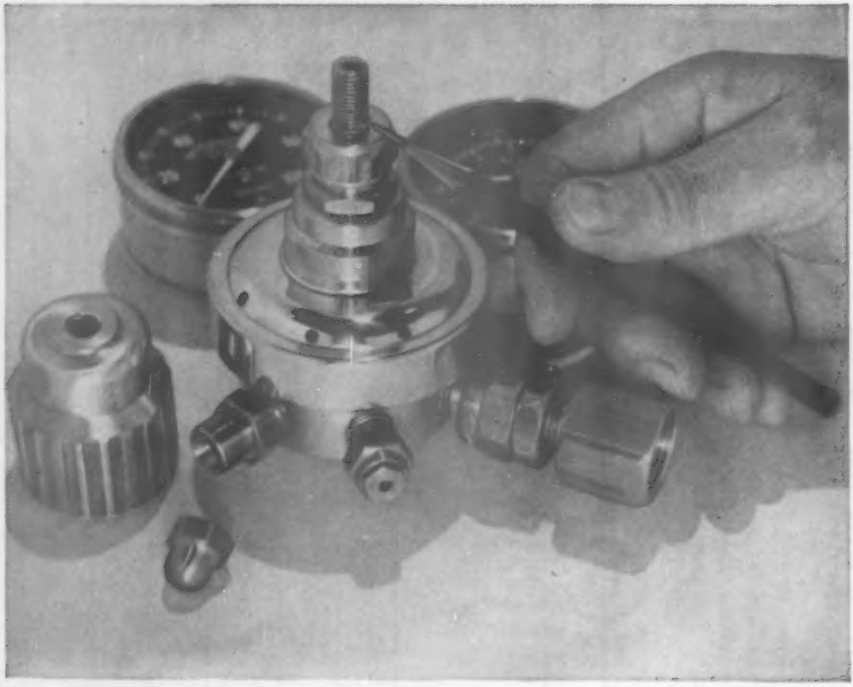
9

ANACONDA welding rods

NAME OF WELDING ROD	APPROX. MELTING POINT. DEGREES Cent.	Fahr.	USUAL APPLICATIONS
*ANACONDA COPPER-372 (Patent No. 2,220,464)	1075	1967	Inert-gas arc and oxyacetylene welding of copper.
TOBIN BRONZE-481	885	1625	Oxyacetylene braze welding of steel, cast iron, and copper alloys.
ANACONDA-997 (Low-Fuming) BRONZE	870	1598	A low-fuming manganese bronze for use where the highest weld metal properties are required. Oxyacetylene braze welding of steel, cast iron, and copper alloys, and for bearing surfaces.
NICKEL SILVER-828	930	1706	Oxyacetylene braze welding of cast iron and steel for strong, color-matching welds and bearing surfaces.
CUPRO NICKEL-826 (Patent No. 2,012,450)	1225	2237	Oxyacetylene welding of Cupro Nickel and surfacing of steel.
*EVERDUR-1010	1019	1866	Inert-gas arc, carbon-arc and oxyacetylene welding of Everdur, copper and copper alloys. Also for welding to, and for surfacing steel.
*PHOSPHOR BRONZE-351	1050	1922	Inert-gas and carbon-arc welding of phosphor bronze and copper, and for surfacing steel.
*PHOSPHOR BRONZE-354	1000	1832	Inert-gas and carbon-arc surfacing of steel, and for welding phosphor bronze.
**AMBRALOY-928	1040	1904	Inert-gas consumable-electrode welding of aluminum bronze and for surfacing steel.

*These alloys are also used in the inert-gas consumable-electrode process. Spooled rods are marketed by the manufacturers of the welding equipment.

**Supplied only on spools by the manufacturers of the welding equipment.



sealed in smoothness...
neither dirt nor trouble can enter here

Tension screw wear and sticking is a sign of poor design and inadequate manufacture — it is not necessary for you or your operator to struggle with regulator tension screw adjustment. The answer to this problem is simple — *keep foreign matter out of the threaded parts.* This tension screw is fully protected by a unique packing and a special type of friction bushing. Just try this regulator tension screw — adjust it yourself and feel how smoothly it works; you can reach maximum delivery pressure effortlessly.

National

NATIONAL welding equipment company... 218 fremont street san francisco 5 california

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Circle No. 58 on Reader Service Card.

held by the **AMERICAN WELDING SOCIETY**

NATIONAL FALL MEETING

OCT. 17-21 PHILADELPHIA

- OVER 60 TECHNICAL PAPERS
- NATIONAL METALS EXPOSITION

Latest trends, developments and uses of welding will be revealed at the National Fall Meeting of the American Welding Society in Philadelphia, October 17-21, 1955. Over 60 papers covering all phases of welding activity will be presented in the 21 sessions to be held at the Bellevue-Stratford Hotel.

A few of the subjects to be discussed are carbon dioxide-shielded metal arc welding; advances in welding titanium and molybdenum and application of welding to shipbuilding, piping, pressure vessels and machinery.

Other papers which should attract interest are those on welding of stainless steels, new approaches to welding with continuous-fed electrodes, pressure welding rails and use of iron powder electrodes.

Highlight of the technical sessions will be the Adams Lecture to be given by LaMotte Grover of Air Reduction Sales Co. At this honors sessions, to be held Monday morning, a number of other awards will be presented for outstanding contributions to the advance of welding.

Other events to be held during the five day meeting include the President's Reception and National Dinner, several tours through manufacturing plants in the Philadelphia area and educational lectures.

The AWS Fall Meeting will run concurrently with the National Metals Exposition at which welding and cutting exhibits and demonstrations will be shown. Exposition will be held in Philadelphia's Convention Hall.

YOUR GUIDE TO THE SHOW . . . these pages contain information on the technical program for the A.W.S. Fall Meeting and welding exhibitors at the National Metals Exposition. Take these pages with you. They will be of value in helping you use your time to the best advantage.

Tentative Technical Program

AWS National Fall Meeting

Philadelphia, Penna.
October 17-21, 1955

OCT. 17, MONDAY AFTERNOON—Three Simultaneous Sessions

1. CO_2 GAS SHIELDED WELDING

A. Carbon-Dioxide Shielded-Metal Arc-Welding Process
by Robert J. Keller and John P. Koss, A. O. Smith Corp.

B. Moisture and Its Effects in Carbon Dioxide Welding of Steel
by Roger W. Tuthill, General Electric Co.

C. Electrode Characteristics for Welding Mild Steel in Atmospheres of Carbon Dioxide by the Consumable-Electrode Gas-Shielded Welding Process
by Robert D. Mann and Julian D. Carey, General Electric Co.

2. RESISTANCE WELDING

A. The Behavior of Spot-Weld Cross-Section During Loading
by John F. Rudy, Wright Air Development Center, Roy B. McCauley and Robert S. Green, Ohio State University

B. Seam Welding Dissimilar Thicknesses of Low-Carbon Steel
by M. L. Begeman and Ernest J. Funk, University of Texas

C. Resistance Spot-Welding Schedules for Welding Projection Hardware to Mild Steel Sheet and Plate
by O. K. Barnes, Westinghouse Electric Corp.

3. WELDABILITY AND RESEARCH

A. Effect of Preheating on Stress-Corrosion Cracking of Steel Weldments
by E. Paul DeGarmo and I. Cornet, University of California

B. Heat Treatment of Air Hardening Alloys on Welding
by John J. B. Rutherford and John F. Ewing, Babcock & Wilcox Co.

C. The Development of High-Tensile High-Impact Electrodes
by G. S. Wepfer, A. O. Smith Corp.

OCT. 18, TUESDAY MORNING—Three Simultaneous Sessions

4. WELDABILITY AND RESEARCH

A. Further Studies of the Hot Ductility of High-Temperature Alloys
by Ernest F. Nippes and Warren F. Savage, Rensselaer Polytechnic Institute

B. Influence of Lattice Structure Upon Strength of Ductility-Temperature Relationships
by Julius Heuschkel, Westinghouse Electric Corp.

C. A Welding Test for Gray and Nodular Cast Iron
by A. L. Schaeffler and W. A. Schumbacker, Allis-Chalmers Manufacturing Co.

5. STRUCTURES

A. Fatigue Strength of Welds in Low-Alloy Structural Steels
by G. E. Nordmark, W. H. Munse, J. E. Stallmeyer and N. M. Newmark, University of Illinois

B. Welding of Structural Steel for Hartford Library
by Carl L. Kreidler, Lehigh Structural Steel Co.

C. Fabrication of Crosshead Beams for the World's Largest Hydraulic Press
by V. M. Nigriny, The Midvale Co.

6 INSPECTION AND TESTING

A. Backing Ring Elimination Permits Ultrasonic Testing and Avoids Cracking of Piping Welds
by Wilfred A. Pollock, Wisconsin Electric Power Co.

B. The Gamma Radiographic Control of Welded Transmission Pipe Lines
by Colin M. C. Bates, Welding Supervision Ltd.

C. Radiography in the Jungles of Sumatra, Indonesia
by Walter W. Offner, X-ray Engineering Co.

OCT. 18, TUESDAY AFTERNOON—Three Simultaneous Sessions

7. WELDABILITY AND RESEARCH

A. The Effect of Microstructure on Notch Toughness and Fracture Morphology—Part II
by Joseph C. Danko, John H. Gross and Robert D. Stout, Lehigh University

B. Crack Arresting by Overlays of Notch Tough Weld Metal
by P. P. Puzak and W. S. Pellini, Naval Research Laboratory

C. Studies on the Brittle Failure of Tankage Steel Plates
by M. S. Northup, F. J. Feely, Jr., and S. R. Kleppe, Esso Research & Eng. Co., Max Gensamer, Columbia University

8. SHIPBUILDING

A. Offshore Drilling Barges
by Robert H. Macy, The Ingalls Shipbuilding Corp.

B. Building an All-Welded 96-Ft. Twin-Screw Yacht
by LaMotte Grover, Air Reduction Co., and E. H. Holder, Ingalls Shipbuilding Corp.

C. Stress Studies of Various Shaped Welded Doublers in Hatch Corner
by Yoshio Akita, Transportation Technical Research Institute of Japan, H. Kihara, University of Tokyo, N. Ando, Transport Technical Research Institute and K. Yoshimoto, Ishikawajima Heavy Industry Co.

9. WELDING EQUIPMENT

A. Characteristics of a Rectifier Type Constant Voltage Power Supply
by Jesse W. Pomazal, Harnischfeger Corp.

B. Transient Problems When Using Hypersil Transformers in Welding Applications
by Robert C. Mierendorf, Square D Co.

C. Power Sources for Inert-Gas-Shielded Consumable Electrode Welding
by A. Lesnewich and Everett Cushman, Air Reduction Co., Inc.

OCT. 19, WEDNESDAY MORNING—Three Simultaneous Sessions

10. STAINLESS STEELS

A. Mechanical Properties of Modified Type 347 Weld Deposits
by Lorin K. Poole and R. David Thomas, Jr., Arcos Corp.

B. Hot Cracking of Stainless Steel Weldments
by P. P. Puzak, W. R. Apblett and W. S. Pellini, Naval Research Laboratory

60 Technical Papers on Welding and Cutting

C. Permeability and Crack Sensitivity of Stainless Welds
by John L. Lang and Charles Wright, Jr., Lukens Steel Co.

11. WELDING ELECTRODES

A. Metal Powder Electrodes and Their Applications
by E. DiLiberti, Air Reduction Sales Co.

B. Properties and Applications of Low-Hydrogen Iron Powder Electrodes
by D. C. Smith, W. G. Rinehart and D. C. Helton, Harnischfeger Corp.

C. Effect of Individual Coating Ingredients on Surface Tension of Iron Electrodes
by Thomas H. Hazlett and Earl R. Parker, University of California

12. APPLICATIONS

A. Selection of Proper Inert-Gas-Shielded Arc-Welding Process
by J. Warden Cunningham and Harry A. Huff, Jr., Air Reduction Sales Co.

B. High-Speed Welding of Steel Compressor Cases
by C. F. Stephenson, York Grantly Division of York Corp., and Robert A. Stone, Air Reduction Sales Co.

C. New Surfacing Techniques
by K. H. Koopman and R. S. Zuchowski, Linde Air Products Co.

OCT. 19, WED. AFTERNOON—Three Simultaneous Sessions

13. TITANIUM & MOLYBDENUM

A. Welding of Titanium
by E. F. Gorman, Linde Air Products Co.

B. Resistance Welding Ductile Joints in Commercially Pure Titanium
by Robert Wickham, Marquardt Aircraft Co.

C. Effects of Oxygen on Soundness and Ductility of Molybdenum Welds
by W. N. Platte, Westinghouse Electric Corp.

14. WELDING ELECTRODES

A. A New Approach to Welding of Alloy Steels with Alloy Fluxes
by Emmett Smith and Paul Jerabek, The Lincoln Electric Co.

B. The Effect of Aluminum Additions to Mild Steel Weld Metal
by Craig R. Sibley, Air Reduction Co., Inc.

C. Effect of Current and Atmospheres on Arc Temperatures
by George M. Gordon, Olga A. Cotter and Earl R. Parker, University of California

15. PRESSURE VESSELS

A. Performance of High-Strength Pressure Vessel Steels
by J. H. Gross and R. D. Stout, Lehigh University

B. Resistance of Low-Alloy Steel Plates to Biaxial Fatigue
by C. E. Bowman and T. J. Dolan, University of Illinois

C. The Practical Approach to the Welding of Stainless Steel Pressure Vessels
by Frederick H. Clash, Jr., Link-Belt Co.

OCT. 20, THURSDAY MORNING—Three Simultaneous Sessions

16. ALUMINUM

A. Inert Shielding Gases for Welding Aluminum
by James D. Dowd, Aluminum Company of America

B. Hydrogen vs. Acetylene vs. Inert Gas in Welding Aluminum Alloys
by J. Koziarski, Piasecki Helicopter Corp.

Originators not Imitators

"Every kind of imitation speaks the person that imitates as inferior to him whom he imitates, as the copy is to the original."

LORD SOUTH

R. D. Wasserman

In every age, in welding and every other industry, you will always find those whose only claim to fame for their product is that it is "just as good." More than 50 years ago, J. P. H. Wasserman, a Swiss metallurgist, pioneered a new welding process which provides the high strengths of fusion welding using the lower heats associated with brazing.

And, year after year, "Eutectic" has originated new and ever better welding alloys to make the weldor's job easier and more profitable. The rapidly increasing preference for Eutectic "Low Temperature Welding Alloys"® in over 87,000 American industries is proof of Eutectic's leadership. It is testimony that the American weldor is too smart to be fooled by imitations. He realizes the importance of getting all the advantages of Eutectic's "Low Heat Input" metal joining process — elimination or minimization of over heating, warping, distortion, embrittlement and other dangers to base metals.

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Today, in Eutectic's own research centers throughout the world, teams of metal experts create and test newer and better products for metal joining. And, in its own up-to-the-minute plants, meeting rigid standards of quality, "Eutectic" turns these research products into "Low Temp" EutecRods and "Low Amp" EutecTrodes that bring the benefits of "Low Heat Input" metal joining into shops everywhere.

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These seals denote our proud contribution to American industry: 15 Years of "Golden" Savings, 50 Years of Research. These years have seen many great achievements. And, for the future, we look forward to ceaseless weldgineering and the continued application of Eutectic's research to your service.

President, Founder, Director of Research

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A FEW "EUTECTIC" FIRSTS
1940—1955

U. S. Patent #2,288,869. First Torch Alloy for joining cast iron with color match, without fusion.
U. S. Patent #2,471,803. First "Low Amp" coating for metal arc welding of cast iron.
U. S. Patent #2,632,000. First low-melting electrode for high strength joining of aluminum.
U. S. Patent #2,632,835. First "Low Amp" electrode coating for high alloy steels.
U. S. Patent #2,626,339. First electrode for high tensile strength joining of copper.

ORIGINATORS NOT IMITATORS

The research behind this phrase is your assurance that you are applying advanced "Low Heat Input" metal joining techniques to your critical work and that you have the most modern developments at your fingertips.

Don't be fooled by those who tell you that any ordinary rod or electrode is "just as good!" Nothing can match Eutectic "Low Temperature Welding Alloys" performance.

Remember, it is the quality of the finished job and the ease and speed with which you do it that determines real economy, and not a few pennies difference in original cost.

READY TO PROVE WHAT WE SAY

To bring you all the benefits of Eutectic's research, our District Engineers are ready to go right into your shop to show you how the same electrode holder or torch you use with conventional materials gives you "Better, Faster, Cheaper" welds with "Low Temp" EutecRods and "Low Amp" EutecTrodes . . . with substantial savings in work, time, gas and welding materials.

YARDSTICK OF PERFORMANCE

To help you select from among the more than 160 EutecRods and EutecTrodes those that will give you largest savings per job, write for your free copy of our new 32-page DirectoRod Guide.

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To WELD or CUT

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Dockson Outfits are made up after careful field analysis to handle a wide range of welding and cutting jobs.

FOR EXAMPLE—The Dockson No. 145 Outfit illustrated, is for light and medium range welding and cutting operations up to and including 5" steel. It includes at one low price:—No. 4-E-C—Hi-Speed Welding Torch with sizes 2, 4, 6, 8 and 10 "E" Style Elbow Tips ● C-4 Hi-Speed Cutting Attachment with C-2 Tip ● No. 134—BE Oxygen Regulator (200 and 3000 lb. gauges) ● No. 134-AD Acetylene Regulator (50 and 500 lb. gauges) ● Commercial to P.O.C. Adaptor ● 12½ ft. of ¼" Siamese Hose and 4 Hose Connections ● Outfit Wrench ● Round File Gas Lighter ● One Pair of 66-19-6 Welding Goggles.

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Authorities Explain Welding Problem Metals

C. Welding Aluminum to Copper Using Inert-Gas Metal-Arc Process
by L. A. Cook and M. F. Stavish, Kaiser Aluminum & Chemical Corp.

17. PIPING & PRESSURE VESSELS

A. Welding of High-Temperature High-Pressure Piping with Chrome-Moly Electrodes
by Lloyd D. Nesbitt, Metal & Thermit Corp.

B. The Application of Inert-Gas Tungsten-Arc Welding to Carbon Steel Pipe
by F. J. Pilia and R. W. Minga, Linde Air Products Co.

C. Welding of Pressure Vessels with Automatic Submerged Arc
by Wilmer W. Weber, The Pfaudler Co.

18. APPLICATIONS

A. Automation of Metal Manufacturing Requires Correct Use of Arc Welding
by H. O. Klinke, The Taylor-Winfield Corp.

B. How to Apply Automatic Submerged Arc Welding
by Robert Wilson, The Lincoln Electric Co.

C. Lower Part Cost by Projection Welding
by C. H. Burgston, Deere & Co.

OCT. 21, FRIDAY MORNING—Three Simultaneous Sessions

19. BRAZING

A. Wettability of Steel with Pure Silver and Silver Brazing Alloys
by Nikolajs Bredzs, Armour Research Foundation of Illinois Institute of Technology

B. Physical Properties of Butt Joints Brazed with BCu, BAg-1, and BAg-3 Filler Metals
by Grant Hansel, Jr., Materials & Processes Laboratory, General Electric Co.

C. Automatic Blade of High Solidity Axial Flow Fans
by John B. Hill, Jr., Sawyer-Bailey Corp.

20. MAINTENANCE & PRODUCTION

A. Effective Welding Circuit Maintenance
by Donald L. Caldwell, Caterpillar Tractor Co.

B. Production Methods for the Fabrication of Rear Axle Housings
by E. Lommel, Chevrolet Division, General Motors Corp.

C. Contour Beveling with the Electronic Tracer
by Howard B. Cary, Marion Power Shovel Co., and R. F. Helmkamp, Air Reduction Sales Co.

21. APPLICATIONS

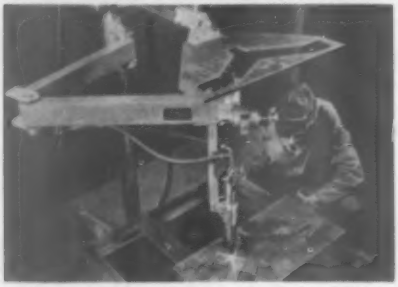
A. How to Use Steel Effectively in Machinery
by Omer Blodgett, The Lincoln Electric Co.

B. An Application of the Pressure Welding Process to Fabricate Continuous Rail
by D. C. Hastings, Richmond, Fredericksburg and Potomac Railroad Co.

C. Manual Arc Welding of Butt Joints in Crane Rails
by Ivan Kutuchief, A. O. Smith Corp.

Here's Complete List of Welding Exhibitors at 1955 Metal Exposition—October 17-21.

AIR REDUCTION SALES CO. 1750



New products introduced include cutting machine, automatic inert arc welding head and constant potential arc welder.

ALLEGHENY LUDLUM STEEL CORP. 120

Stainless steel that can be fabricated in soft and ductile state and hardened by subzero cooling is featured.

ALLISON CO. 1420

ALPHA METALS, INC.....955

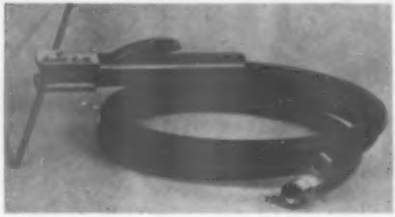
AMERICAN BRAKE SHOE CO.....352

AMERICAN BRASS CO. 211

AMERICAN CHAIN & CABLE CO., INC. 1044

AMERICAN OPTICAL CO. 925

ARCAIR COMPANY 1066



Carbon arc — compressed air gouging torch and burners' aid kit for manual flame cutting will be demonstrated.

ARO SPOTWELDERS CORP. 1316

BALTEAU ELECTRIC CORP. 115

Complete line of industrial radiography equipment, including portable types, are featured.

(Turn to Page 117)

WHAT TO SEE AT THE SHOW

Exhibitors listed on these pages will feature equipment, accessories and auxiliary products for use in arc and inert arc welding, oxy-acetylene welding and brazing and resistance welding. If you are unable to attend the show and would like additional information about new products exhibited, write the manufacturer directly or send your letter to the Editor, INDUSTRY & WELDING Magazine, 1240 Ontario St., Cleveland 13, Ohio.

See it at the National Metal Show
October 17-21, Philadelphia
Airco Booth #1750

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CAMOGRAPH
for
repetitive,
accurate shape cutting!

The new #42 Camograph is a low-priced, accurate, shape-cutting machine which can be used as a major production tool to turn out thousands of *identical* flame cut parts – or – as an auxiliary unit to supplement the output of larger, more expensive machines. Here are a few of its many features:

- **Unerring Accuracy.** Permanently magnetized tracer hugs steel template. Knurled roller follows most intricate shapes at constant speed – driven by adjustable-speed, governor-controlled motor through *positive* worm-gear drive – no couplings, pulleys or belts.
- **Cuts any shape** up to a *full* 42" circle – straight lines to 92".
- **Accommodates wide range** of Genuine Airco tips in sizes to shape-cut steel of any practicable thickness.
- **Tracer head is permanently magnetized** – operated by an adjustable speed, governor-controlled motor.
- **Portable** – move it from location-to-location, easy to setup and level.

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Air Reduction Pacific Company
Represented Internationally by
Airco Company International
Foreign Subsidiaries:
Air Reduction Canada Limited
Cuban Air Products Corporation

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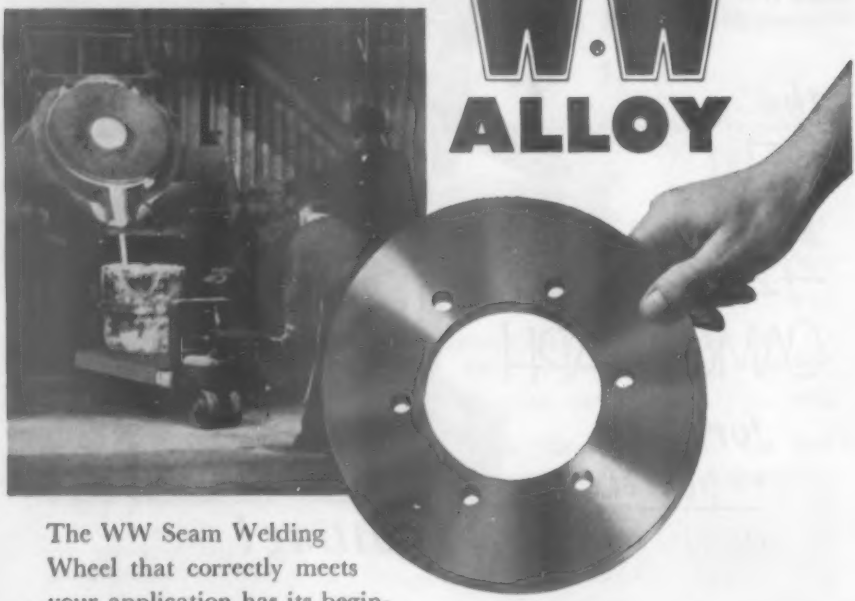
FIRST . . . it's a W.W ALLOY



The WW Seam Welding Wheel that correctly meets your application has its beginning in the *premium quality* WW alloy from which it is made.

We make the alloys right from the beginning; we know they are right. Right in strength, right in hardness, right in electrical conductivity, right for better wear and right for better welds.

WW's specialized skill and production facilities assure you Seam Welding Wheels of uniform dependability for strong, clean welds; long production runs; minimum downtime. Standard blanks from stock . . . specials to order: supplied finished or rough for your own machining.

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Division of Fansteel Metallurgical Corporation

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Home of Premium Quality Alloy Castings and Forgings

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BANNER WELDER CO. 1251

Special seam welder, which welds flat metal sheets into tubes and cylinders, is introduced.

BAUSCH & LOMB OPTICAL CO.....440

Complete line of optical equipment, including a variety of microscopes and magrascopes, are displayed.

BLACK & DECKER MFG. CO. 1707

CHICAGO TOOL & ENGRG. CO...1654

COAST METALS, INC. 1907

COPPERWELD STEEL CO. 310

DETREX CORPORATION 1205

DETROIT TESTING MACHINE CO. 545

DEVILBISS COMPANY 751

DIVERSEY CORPORATION 844

New electrocleaning tank will be demonstrated. Processing of aluminum sheet prior to resistance welding will be done.

ELECTRIC ARC, INC. 1650

EMPIRE PRODUCTS, INC. CAM-LOK DIVISION 1827

EUTECTIC WELDING ALLOYS CORP. 1225

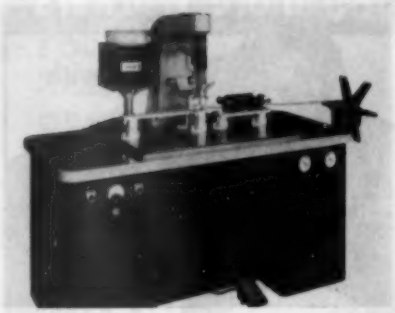
Variety of new welding electrodes, oxy-acetylene welding rods and brazing alloys will be featured.

GAS APPLIANCES SERVICE, INC. 1932

GENERAL ELECTRIC CO. 1572

Complete line of arc welding machines, electrodes and auxiliary equipment for welding will be featured.

GRAHAM MFG. CORP. 2031



Fully automatic stud welding machine will be introduced and demonstrated. Unit utilized stored energy and will weld studs to strip stock from a coil.

GRAND SPECIALTIES CO. 101

Complete line of clamps, including welding clamps, are on display.

HARNISCHFEGER CORP. 1657

New line of welding positioners, will be demonstrated. Variety of arc welding machines will be displayed.

HEATH ENGINEERING CO. 960

HOBART BROS. COMPANY 1020

Constant voltage arc welder will feature display of complete line of welding electrodes and machines.

HOLGER ANDREASEN, INC. 961

Complete line of industrial radiography equipment will be shown.

INDUCTION HEATING CORP. 1242

INDUSTRY & WELDING MAGAZINE 954

INDUSTRIAL PUBLISHING GROUP 954

60 more workers

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Recommended and sold by the world's largest manufacturers of welding equipment.

The exclusive circle design found only in Wypo Cutting and Welding Tip Cleaners provides as many as 60 more cleaning edges per inch of cleaner.

Straight sided valleys, another outstanding feature of Wypo Tip Cleaners, insures a thorough cleaning and removal of all waste.

STANDARD SET OF 12 Cleans 27 Drill Sizes Nos. 75 to 49 incl.
JUMBO SET OF 9 Cleans 19 Drill Sizes Nos. 48 to 30 incl.
MASTER SET OF 21 Cleans 46 Drill Sizes Nos. 75 to 30 incl.

DOUBLE THE LIFE OF YOUR WELDING AND CUTTING TIPS

Fast, easy cleaning without jamming, scratching or enlarging the tip port means added years of service to your welding and cutting tips. Only with Wypo Tip cleaners do you get thorough cleaning and polishing with one quick easy motion. Wypo Tip Cleaners are specified for all types of welding cleaning jobs by the U.S. Navy, leading railroads, oil companies, steel mills, ship yards and industrial plants. Packed in a handy metal container. Buy Wypo Tip Cleaners at your welding supply dealers today.

U.S. Patent No. 2,429,581
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1395 Obispo St., Long Beach 4, Calif.

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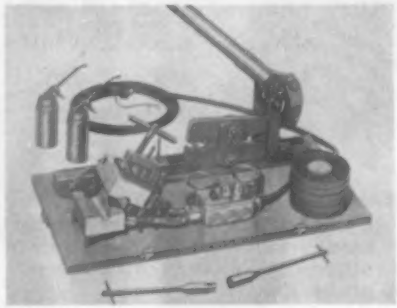
Welding Exhibitors at

INDUSTRILINE, INC. 1827



Portable, 110 volt molding kit, which makes water-proof neoprene-insulated heavy-duty cable connection, is introduced.

INTERNATIONAL NICKEL CO., INC. 309

Dissimilar welding electrode and complete line of nickel alloys and welding products are on display.

JOMAC, INC. 1070

Complete line of industrial work gloves will be shown.

KASSON DIE & MOTOR CORP. ..1277

Portable AC welder and new spot welder will be featured.

LAKE CHEMICAL CO. 506

Self-cleaning, non-acid flux and complete line of sealing compounds are demonstrated.

LAPEER MFG. COMPANY 706

Complete line of clamps, including toggle-action clamps and pliers, are shown.

LEPEL HIGH FREQUENCY LABS, INC. 1256

LINCOLN ELECTRIC CO. 231
New line of automatic welders and power sources for submerged arc welding are introduced.

LINDBERG ENGINEERING CO. 230

LINDE AIR PRODUCTS CO. 1375
Revolutionary new cutting process will be introduced. Flame plating display and complete film program are other features.

LIQUID CARBONIC CORP. 1478
Carbon dioxide - shielded arc welding will highlight display that includes complete line of arc welding and oxy-acetylene welding equipment.

MAGNAFLUX CORP. 446

MARKAL COMPANY 506
Industrial paint in stick form for marking and identifying and high temperature protective coatings are shown.

MERRILL BROTHERS 1354
Variety of material handling clamps and holding devices are shown.

METAL & THERMIT CORP. 153
New system for welding chrome-moly steels is featured. Special electrodes for use with system are demonstrated.

METALLIZING CO. OF AMERICA 2061

MITCHELL RADIATION PRODUCTS CORP. 2016

NATIONAL TORCH TIP CO. 2149

NATIONAL WELDING SUPPLY ASSOC. 1961

NORTH AMERICAN PHILIPS CO., INC. 1154
Industrial radiography equipment and tungsten electrodes for inert arc welding are featured.

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Small or large—OHMSTEDE's time and labor saving equipment provides faster, easier cutting at lower costs.

Here are 8 big reasons why OHMSTEDE is your best buy.

- Unlimited variety of shapes
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- Operates on either alternating or direct current
- Delivered with base—no extras required
- Sealed ball bearing construction
- Enclosed motor
- Low initial cost—high efficiency

OHMSTEDE flame cutting machines are the end-result of many years of development. Ruggedly constructed, they give trouble-free service and unexcelled performance under all conditions of use.

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Welding Exhibitors at

OAKITE PRODUCTS, INC. 1767

OHIO CRANKSHAFT CO. 1509

TINIUS OLSEN TESTING MACHINE CO. 1428

OSBORN MFG. COMPANY 718

PHOENIX PRODUCTS CO. 1672

Complete line of electrode drying ovens are displayed.

PRECISION WELDER & FLEXOPRESS CORP. 1158

REID-AVERY CO., INC. 1519

Complete line of manual and automatic arc welding electrodes, wire and equipment are featured. Low hydrogen metal powder electrode is demonstrated.

JOSEPH T. RYERSON & SON, INC. 931

SCIAKY BROS., INC. 946

Complete line of resistance welding equipment is featured.

SELAS CORP. OF AMERICA 1601

A number of new heat processing methods will be highlighted. Among demonstrations will be production brazing machine which illustrate packaged-brazing-unit technique.

SKIL CORPORATION 1980

A. O. SMITH CORP. 1842

Complete line of arc welding machines and electrodes is featured.

SMITH WELDING EQUIPMENT CORP. 1714

Complete line of oxy-acetylene welding equipment and accessories is featured.

SPERRY PRODUCTS, INC. 1320

STANLEY ELECTRIC TOOLS 2123

1955 Metals Exposition

STEEL CITY TESTING MACHINES, INC. **324**

TEMPIL CORP. **1533**

Complete line of temperature indicating materials, including crayons, pellets and liquids, is demonstrated.

THOMSON ELECTRIC WELDER CO. **971**

THOR POWER TOOL CO. **731**

TITAN METAL MFG. CO. **341**

TORIT MFG. CO. **1454**

TRIPLETT & BARTON, INC. **254**

TURCO PRODUCTS CO. **1319**

UNION CARBIDE & CARBON CORP. **1375**

Various divisions will feature hard facing alloys and oxy-acetylene welding equipment and accessories.

UNITED WELDERS, INC. **521**

UNIVERSAL CYCLOPS STEEL CORP. **1520**

UNITED WIRE & SUPPLY CORP. ... **2009**

Brazing alloys in every form and for practically every application will be featured.

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ARCAIR electrodes enable you to realize the full performance and economy designed into your Arcair torch. No substitute electrode will perform as well or give as much value as genuine Arcair carbon-graphite electrodes. Arcair electrodes employ a special compound of carbon and graphite, developed and processed especially for use with the Arcair torch. This unique blending of carbon and graphite results in an electrode with the best qualities of each material, as well as superior arc stability. Recent tests proved the average life of an Arcair electrode to be *36% better than a popular competitive grade, yet Arcair costs about one-half as much!*

Arcair superior carbon-graphite electrodes are available in plain or copper-coated types in sizes $\frac{5}{32}$" to ½" in diameter. Special metal electrodes are also available for exceptional requirements of cast iron and copper alloy work. We want you to prove the money saving features of these electrodes ON YOUR OWN WORK! Write us for FREE SAMPLES of Arcair electrodes, along with additional test data.

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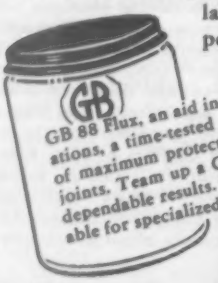
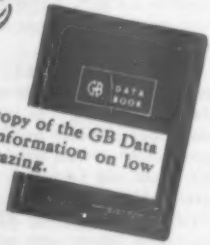
GB Silver Brazing Alloys meet all standard specifications. Available in random coils, strip, preformed rings and special shapes. This is your answer to sound, leak-proof joints on virtually any ferrous or non-ferrous metal. Silver Brazing Alloys are easy to use in production, save time, labor and assure dependable results.


GB
GB 88 Flux, an aid in silver brazing operations, a time-tested product, assures you of maximum protection and high quality joints. Team up a GB Alloy and Flux for dependable results. Other GB Fluxes available for specialized application.



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WELDING EXHIBITORS . . .

VACU-BLAST COMPANY, INC.....811

VICKERS ELECTRIC DIV. 1771

DC rectifier-type welder with magnetic amplifier is displayed.

WALES-STRIPPIT CORP. 1210

WELLS MFG. CORP. 730

WELTRONIC CORP. 1995

WESTINGHOUSE ELECTRIC CORP. 1510

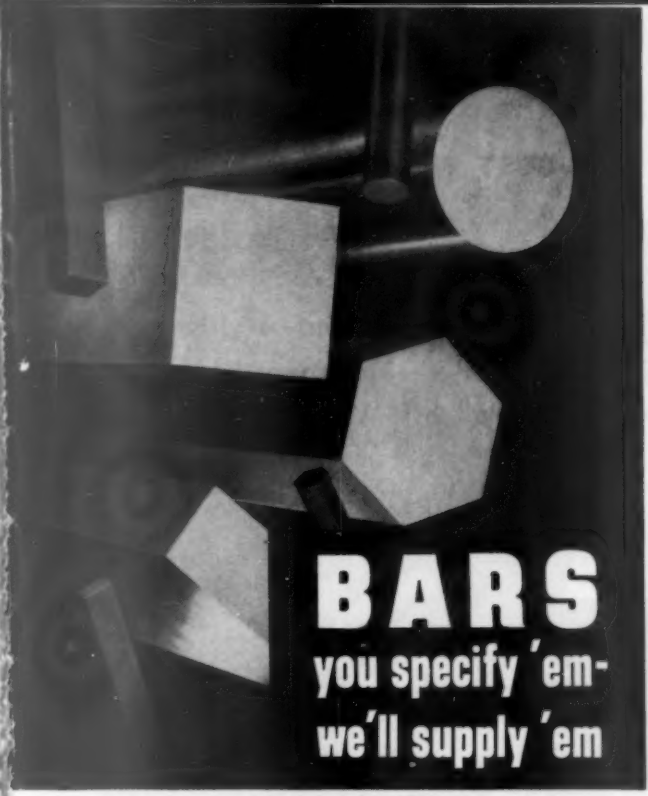
Redesigned line of AC and DC welding equipment and a new AC/DC aircraft welder will be introduced.

WHEELABRATOR CORP. 1402

New airless abrasive blast cleaning machine is highlight of exhibit.

WHITEHEAD METAL PRODUCTS CO., INC. 1344

Circle No. 68 on Reader Service Card. →



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ALLOY BARS. Hot rolled, cold finished and Aircraft Quality. All sold with USS guarantee of minimum hardenability. Each order includes specific data on the alloy bought.

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—arc height: floor level to 8 ft.
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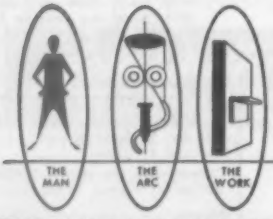

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Eliminate Inside Bead in Welded Pipe and Tubing

A NEW welding process developed to fabricate stainless steel and high alloy tubing and pipe is said to provide better physical and mechanical properties, better appearance and increased corrosion resistance.

Patented by Trent Tube Co., a subsidiary of Crucible Steel Company of America, the process is said to make possible fabrication of many alloys that have never before been furnished in welded tubing. These include various Hastelloy grades zirconium, zircoloy and titanium. The process has also made possible production of many alloys in a wider size range than ever before.

Eliminate Inside Weld Bead

Secret of the new process is elimination of the weld bead on the inside diameter of the tubing. This bead, which had made it difficult to produce high quality pipe after cold working operations, is eliminated by inverting the rolls of the continuous tube mill and welding formed tubing from the underside. This permits gravity to take over and eliminate the weld bead on the inside diameter of the tubing. Even in the as-welded condition, tubing has perfectly smooth and flawless interior surfaces.

The new method of forming stainless and high alloy tubing and pipe utilizes tungsten inert-gas shielded-arc welding. Arc length is automatically maintained. No additional metal is required; weld is a complete fusion of butted edges of the strip.

This results in a weld which has

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Weld-O-Vent

WELDING FUME EXHAUSTERS
MANY EXCLUSIVE FEATURES
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ENGWALD CORP.
"The World's Finest Exhaust Systems"

- Portable and stationary units for all applications.
- Unlimited flexibility, fast, easy positioning, over 360° radius.
- Blowers can be attached to units or mounted at remote points connecting with ductwork.
- Units can be connected in series.

High Velocity Hood Quickly Removes Smoke and Fumes.

Available in 9, 12, or 16 feet reach units.

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Manufacturers
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the same composition as the parent metal and is free from inclusions and oxides, and makes it possible to consistently utilize the potentials of welded stainless steel tubing and pipe.

Control Weld Bead

Now, close control of weld bead made possible by the new welding technique has brought about many metallurgical and mechanical improvements in welded tubing and pipe. Pipe can be cold worked or drawn after welding without developing grooves, valleys or undercuts in the weld area. Outside diameter weld bead can be held uniform and smooth so a surface finish similar to that of the original parent metal can be obtained. This makes it possible to reduce weld bead by swaging, and improves mechanical properties without undesirable side effects.

Heavy wall tubing and pipe will meet all mechanical tests, such as flare, transverse, tensile and reverse bend.

New tubing and pipe are said to have much better fabrication properties in the production of tube assemblies, heat exchangers, con-

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Grip-Lug TRACTOR GROUSER RETREAD

- EXCLUSIVE DESIGN
- INCREASED TRACTION
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densers and boilers. Extremely smooth inside is said to offer a better surface for rolling in of tubes in tube sheets.

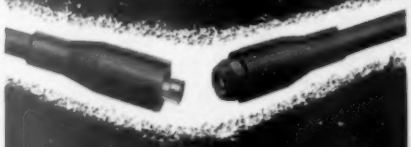
Corrosion resistance has also been improved because absence of valleys or grooves, which simulate an undercut condition, leaves no place for solids to deposit or corrodants to become entrapped. This eliminates possible failures due to pit-type corrosion.

New Training Film On Dye Penetrant Inspection

A full color and sound, twenty-three minute 16mm motion picture titled "Flaw Location with Dye Penetrants" has been completed by Turco Products, Inc., and is available for free showing.

Film demonstrates every aspect of dye penetrant inspections from laboratory theory to authentic production line techniques. On-the-spot inspections filmed include inspection of wing spars at Northrop Aircraft, Inc.; the inspection of truck wheels at Union Pacific Railroad; the inspection of pressure vessel weld seams at Vulcan Pipe and Engineering company.

make your own



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Now, for the first time, a PORTABLE KIT that will insulate cable connectors with neoprene sleeves, permanently vulcanized to the cable! Tapered sleeve connection produces a waterproof joint when connector is locked. Low cost. No training needed. Outlasts ordinary connections 4 to 5 times. 110 volts A.C.

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Circle No. 72 on Reader Service Card.

new products

For additional information on the products appearing on this and the following pages, mark the key number of the item on the card bound into this issue. Drop the card in the mail—no postage is required.

LATEST AIR-OPERATED PRESS-TYPE SPOT WELDER introduced by Sciaky Bros., Inc., is new Model PMCO 2 ST. Unit features patented three-phase principle which tailors wave shape of welding current to conform with material being welded. It can be used on large production runs on steel, aluminum and magnesium alloys, stainless and air-hardening steels.

Available in 100 KVA at 50 percent duty cycle, machine can be supplied with 36, 48 or 54-inch throat depth and electrode force up to 4300 lbs., at 80 psi pressure. **Circle No. 150 on Reader Service Card.**

FLUX COATING FOR BRONZE RODS. Anyone taking delivery of bronze rod in shipments of 500 pounds or over now can buy flux for it on the rod. Custom coating services available from All-State Welding Alloys Co., Inc., have now been extended so that $\frac{1}{16}$, $\frac{3}{32}$ and $\frac{1}{8}$-inch rods 36-inches long can now be flux coated. Service is also available for $\frac{5}{32}$-inch rod in 18-inch lengths.

Flux is one which will not attract moisture. It is said not to burn back up the rod and will not blister or leave carbon deposits. **Circle No. 151.**

PORTABLE SANDER, GRINDER IDEAL FOR WELD GRINDING AND FINISHING OPERATIONS, Model "E" Sandbrute made by Nedco Company has special heavy-duty 2hp, fan-cooled motor. Features of unit include extra large ball bearings, hardened spiral bevel gears. Rear handle has large safety trigger switch. Gear housing has hand grip for easier operation.

Unit will handle up to 9-inch disc-type wheels and can be adapted for recessed center wheel or discs; 5-inch cup wire brush; 5-inch cup grinding wheel. Unit has no-load speed of 5300 rpm; standard—6000 optional if specified. Sandbrute weighs only 14 pounds and is only 19-inches long. **Circle No. 105.**

A MAGNETIC CENTERING DEVICE DEVELOPED FOR CIRCULAR MACHINE FLAME CUTTING makes it possible to flame cut metals without marring the central area of the plate. Set-ups are claimed to be simpler and quicker than with devices that require machine fitting. The manufacturer, Tradeware Corp., says more uniform cutting can be done because operator does not have to hold this centering device in position. It is said that permanent magnet in the device will resist high temperatures. **Circle No. 152 on Reader Service Card.**

Circle No. 31 on Reader Service Card.→

a truly all-purpose all-position electrode for welding mild steel

THE NEW NCG SUREWELD® "CE" ELECTRODE

NCG's new "CE" Electrode is designed to perform with maximum efficiency over a wider range of applications. It is usable in all positions with AC or DC straight or reverse polarity. Operators like this new rod because it is easy to strike and hold an arc, even with AC at low welding currents and low open-circuit voltages. There is little spatter; the arc is soft; action is quieter, with spray type metal transfer. Beads are smoother, with a fine, even ripple—free from pock-marks and slag inclusions. Slag deposits brush off easily. "CE" deposits with remarkable efficiency in any position. *Sureweld* "CE" conforms in all respects to E-6013 specifications. Your NCG dealer or nearest NCG office will be glad to demonstrate this new rod and let you try it for yourself. Contact him today.

Here are reports from the field:

"The best all-around AC rod I've ever used."

"We are getting very good results with CE. And we like the way the slag practically drops off when cool."

"Beads have exceptionally smooth surface."

"In our book it surpasses any other E-6013 on the market."

"We think it's superior to all other 6013 electrodes in running characteristics."

"We find we can use it on more jobs than any other electrode we've tried."

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EVERYTHING FOR WELDING

A COMPLETE LINE OF LIGHT WEIGHT CARBON STEEL WELDING FITTINGS for gas distribution systems has been introduced by Tube Turns, division of National Cylinder Gas Co. Designed to be employed with light weight piping now being made by several of the larger mills, fittings are produced in sizes ranging from 3 inches through 24-inches, and in suitable wall thicknesses. **Circle No. 153.**

COMPLETELY NEW LINE FOR SUBMERGED ARC WELDING has been created by Lincoln Electric Co. Highlighting new line are three new welding heads and two new power sources.

New welding heads, LAF-3, LAF-4 and LAF-5, offer a choice of heads for either AC or DC current, field or shop welding and constant potential or variable voltage power source and have many important new features.

New power sources include Lincolnweld AC-750, which gives 750 amps continuous duty AC power, and Lincolnweld DC-750, a motor generator machine designed specifically for automatic welding. The latter is rated at 750 amps, continuous duty at 40 volts.

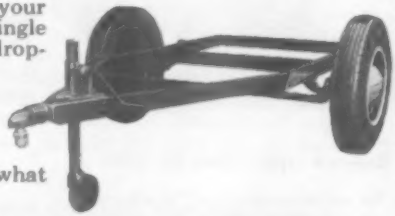
New controls, adjustments and accessories are also available. **Circle No. 45.**

A NEW TORCH FOR INERT ARC WELDING being marketed by Tec Welding Co., features a transparent gas cup made of specially treated quartz. Clear transparent cup surface stays clear permanently and is said to outlast other gas cups under similar working conditions. It is maintained that pencil shaped torch permits more accurate control of welds. Called Visuweld, torch is completely water cooled and weighs only two ounces. **Circle No. 154 on Service Card.**

CASH IN ON TRAILERS

built with Hammer Blow "ready-to-go" running gear!

Build the sport and work trailers your customers want — with Hammer Blow Multi-Purpose Undercarriages. Welded steel channel frames, to your specifications, fitted with standard single or tandem axle, wheeled jack and drop-forged coupler. Capacities to 10,000 lbs. We can also supply component parts in any combination, for assembly in your shop. Over 30 years in business, so our stuff is *good!* Write and tell us what you need!



HAMMER BLOW TOOL COMPANY

WAUSAU 18-J WISCONSIN

Circle No. 75 on Reader Service Card.

New! SHOCKPROOF NOISELESS WELDER!

MARQUETTE'S all new 90 Series A.C. Welder ends all exposure to dangerous welding currents. Its "Perma-Shield" Cabinet, made of *non-conductive fibre glass*, surrounds the welder unit, removing all possibilities of shock from short circuits. The welder is also free of noise. Cabinet vibrations, caused by transformer eddy currents, are stopped as these currents cannot flow through fibre glass.

Here are more outstanding advantages of "Perma-Shield" construction: eddy current losses are ended, raising transformer efficiency about 10 per cent . . . fibre glass is rustproof, corrosion proof and permanently colored . . . and it is stronger than steel.

Two sizes are available. One delivers 200 amperes, the other 275; and each can be capacitor-equipped for power factor correction.

MARQUETTE also manufactures a complete line of AC and DC welders, welding electrodes and welding accessories.

New Ask your distributor to show you Marquette's all new line of "Jet" Series oxy-acetylene welding and cutting equipment.

Contact your MARQUETTE distributor for a FREE demonstration . . . or write us for complete descriptive literature.

When It Comes to Welding Come to

MARQUETTE

WELDING EQUIPMENT — WELDING ELECTRODES

MARQUETTE MANUFACTURING COMPANY, INC.
307 E. Hennepin Avenue, Dept. 5-101, Minneapolis, Minn.

Circle No. 76 on Reader Service Card.

POSITIVE LOCK!

JUST LIKE THE

cam-lok

CABLE CONNECTORS

- Exclusive Cam-Action!
- Locks Tight!
- Stays Tight!
- No Spring Action!
- Releases Easily!

Exclusive Cam-Lok design guarantees positive, vibration-proof connection. Locks tightly in about ½ turn. No spring tension, no weaving or moving of contact surfaces, therefore, no arcing, burning, or freezing.

COMPARE POSITIVE LOCK and these CAM-LOK features with your present connectors:

1. **High Pressure** contact eliminates overheating and current losses.
2. Connects instantly, all cables from #2 to 4/0 **without adapters and without tools.**
3. **Self-compensating** for wear, self-cleaning.
4. Fiber insulation pin, **arcing impossible.**

Write for FREE Literature Today!

cam-lok

DIVISION, EMPIRE PRODUCTS, INC.
P. O. BOX 98-B, CINCINNATI 36, OHIO

Visit Us at Booth No. 1827
at the METAL SHOW
October 17-21, Philadelphia

Circle No. 77 on Reader Service Card.

Portable Spot Welder

A new portable spot welder introduced by Ross Machine Tool Co. features a built-in electronic timing control, thyrotron-type, operating a solenoid contactor. Simply setting the knob on dial at correct timing interval assures uniformly fine welds. Self contained unit, completely water cooled, is encased in sturdy aluminum housing.

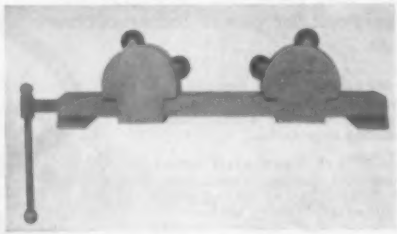
Design features included high amperage (over 17,000 at point of weld), throat depth of 6-inches with variable opening from 3 to 11-inches, capacity to ⅛-inch combined thickness. Welder weighs only 55 pounds and can be quickly mounted on stand for use as foot-operated floor model.

Circle No. 155 on Reader Service Card.

CIRCLE NUMBERS ON THE CARD AND MAIL!

Combination Pipe Dolly

A new combination pipe dolly, which is said to reduce pipe handling time up to 85 percent, has been developed by H & M Pipe Beveling Machine Co. Designed for simplicity of operation and maximum accuracy, dolly provides for adjusting pipe over a variation of several inches.



Use of dolly involves setting travelling heads in a partially closed position, loading pipe in dolly, checking the level and rotating adjustment handle to lower or raise pipe until leveled. Rollers permit adjusting for either manual or automatic welding.

Unit can also be used to align pipe. It handles sizes through 36-inches and has load capacity of 2500 lbs.

Circle No. 156 on Reader Service Card.

The amazing VERSATILITY of EASY-FLO and SIL-FOS

You'd have to go a long way to find a brazing job that these low-temperature silver brazing alloys can't do.

VERSATILITY IN METALS

Between them, the EASY-FLO and SIL-FOS alloys will join practically all ferrous, non-ferrous and dissimilar metals and alloys that have melting points above the alloys' respective flow points.

VERSATILITY IN HEATING METHODS

The EASY-FLO and SIL-FOS alloys work well with all . . . oxyacetylene, natural and city gas torches—gas-air burners —oil, gas and electric furnaces—electric induction, resistance or incandescent carbon—molten alloy or salt dip . . . take your pick.

VERSATILITY IN JOINTS

EASY-FLO and SIL-FOS naturally and consistently make joints that . . . go up to 130,000 psi in tension and 48,000 psi in shear . . . have the ductility to take any stresses and strains the metals they join can stand . . . are liquid and gas-tight . . . have high electrical and heat conductivity . . . offer strong resistance to many corrosive agents.

In the job shown here, induction heating is used to braze steel handle bars to stems with EASY-FLO 35 — 6 at a time in 32 secs. The two jobs shown at left above are gas torch brazed with EASY-FLO 45. Job at right shows brass gasoline petcocks being brazed with EASY-FLO 45 by propane-oxygen burners—1200 per hour.

ADD to their 3-ply versatility the fact that their low flow points protect metals and save gobs of time, labor and heat — and you have every reason to standardize on the EASY-FLO and SIL-FOS alloys for all your brazing.

GET THE FULL STORY IN BULLETIN 20

It's full of useable ideas. Write for a copy today.

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TORONTO, CANADA
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There's no ". . . or equal" for EASY-FLO and SIL-FOS

Circle No. 78 on Reader Service Card.

THIS IS BASIC

The bitterness of poor quality lingers long after the sweetness of low price is forgotten.

It is to your best interest never to forget that there is no Santa Claus in the RESISTANCE WELDING ELECTRODE business.

Whenever price is CUT, quality is CUT! The reasons given you for price cutting are those the price cutter wants you to hear. That is the time to beware, because substitutions can be made in tip manufacture that cut cost and quality, yet are not apparent in the finished product until it is used.

No one can do business long without a *profit*. When a tip price is CUT, something is taken out. That something is QUALITY . . . and its loss will be in proportion to the price cut. If you buy cut-price tips, expect to get cut-quality tips. It is basic that you never get more than you *pay* for.

You EXPECT more from TIPALOY and you GET more! TIPALOY electrodes cost more, but for a slightly higher initial cost these are your major gains:

1. **30% to 100% longer electrode life!**
2. **Less down-time and maintenance!**
3. **More welds per electrode!**

Write for the story of Tipaloy today! Distributor franchises available!

Tipaloy INC 1435 EAST MILWAUKEE DETROIT 11, MICHIGAN

Circle No. 91 on Reader Service Card.

Flame Cutting Machine

A new flame cutting machine which features a permanent magnetic roller has been introduced by Air Reduction Sales Co. The portable No. 42 Camo-

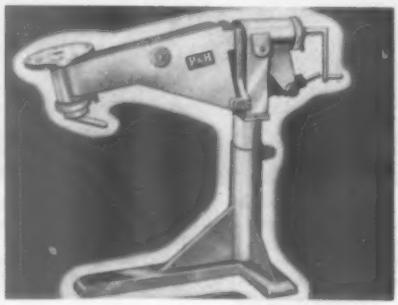
graph is said to cut any shape up to a full 42-inch circle, straight lines to 92-inches and any practicable thickness.

Permanently magnetized tracing roller follows a metal template. Motor drive shaft has no couplings, pulleys or belts; it comes equipped with simple worm-gear drive.

Circle No. 61 on Reader Service Card.

Balanced-Type Positioner

A new, universal-balance welding positioner is being marketed by Harnischfeger Corp. Called UP-1000, units has 1000 lbs. capacity, weighs 200 lbs.,



and occupies 22 x 26-inch floor area. Unit is not motor operated; operator clamps work to table and adjusts spring tension with crank. Light touch guides work to desired angle. Exclusive feature is said to keep unit in static balance even though weldment is rotated or moved horizontally or vertically.

Circle No. 42 on Reader Service Card.

HOW TO BUY ABRASIVE WHEELS

for Longer Life

on Tough Finishing Jobs

"More Use per Dollar"

Look for a *molded* disc wheel, specially bonded for your job conditions . . . to insure free, uniform cutting action down to the last usable part of the wheel.

For roughing and finishing operations on weldments, castings and forgings, molded disc wheels last much longer than ordinary coated abrasive discs. New and sharp abrasive grits are exposed continuously to give clean, fast cutting action . . . the disc does not become dull or loaded. Operator time for wheel changes minimized. Where the molded disc is reinforced with special super-strength fabric and held together with shock-resistant bonds, safety is increased. You get a better finish, faster . . . and save production time and costs.

Specify, by name, the molded disc wheels custom-made for longer, trouble-free service on your roughing and finishing jobs . . . specify Manhattan Moldiscs.

MANHATTAN MOLDISCS

Tests have proved that Manhattan Moldiscs outlast as many as 25 to 30 ordinary coated abrasive discs on many jobs. Every Manhattan Moldisc is custom-made with the rubber or resinoid bond to best suit your application . . . for smoothing welds, beveling edges, removing burrs and fins on mild steels, stainless alloys, aluminum and copper.

Special super-strength fabric reinforcement prevents breakage on the job. Special molded abrasive presents a fresh cutting surface throughout the wheel thickness. Manhattan Moldiscs are bonded in various grades from fast roughing to fine finishing. Let a Manhattan representative demonstrate how you get "More Use per Dollar" . . . with Manhattan Moldiscs and other types of Manhattan high speed, heavy duty abrasive wheels.

RM-826 **WRITE TO ABRASIVE WHEEL DEPARTMENT**

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose Fan Belts • Brake Linings & Blocks • Clutch Facings • Packings • Asbestos Textiles Engineered Plastic, and Sintered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

Circle No. 35 on Reader Service Card.

WELDALOY

bringing a new meaning to the importance of Resistance Welding Alloys . . . by producing the HIGHEST QUALITY AT THE MOST REASONABLE PRICE POSSIBLE!

The Weldaloy organization is dedicated to serve the users of resistance welding . . . to assist them in their selection and specification of electrodes, water-cooled holders, alloys, rod and bar stock, seam welding wheels, castings, and forgings.

Whether you require standard products or specially designed electrodes, dies or other current carrying parts, the Weldaloy team of engineers and metallurgical technicians is ready to help you produce better welds at lower over-all costs.

Complete Weldaloy Products manual available on request. No obligation. Write TODAY!

WELDALOY PRODUCTS CO.
25753 Groesbeck Highway
EAST DETROIT, MICHIGAN

Circle No. 80 on Reader Service Card.

Water-Proof Cable Connections

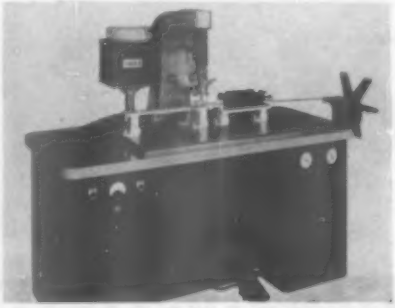
Water-Proof, neoprene-insulated heavy duty cable connections can be made on the job or in the field by a 110 volt, portable molding kit developed by Industriline, Inc. According to the manufacturer, kit permanently seals metal connectors and electrical cable in neoprene rubber sleeves in only five steps. When connectors and sleeves are inter-

locked, connection is said to be water-proof, shock-proof and tight-locking, yet may be instantly disconnected. These new type cable connections are said to eliminate shorts, lethal shock hazards and do away with danger of baring cable strands.

Circle No. 73 on Reader Service Card.

Automatic Stud Welder

A fully automatic stud welding machine has been developed by Graham Mfg. Corp. The stored energy type unit



can be fixtured for welding studs to strip stock. Studs are fed continuously from a coil and welded at rate of approximately 80 per minute. Pedal is supplied to permit single stroke operation.

Circle No. 158 on Reader Service Card.

United's PHOSONS & SILBONDS

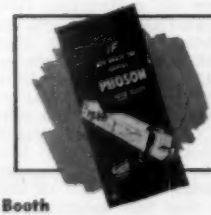
Produced Under One Control

...In Wire, Rod, Strip, Powder and Finished Preforms
for your
Brazing Alloy Requirements

Why are PHOSON and SILBOND "Natural" Brazing Alloy Choices?

Because, despite their remarkably low brazing temperatures, Phoson and Sil-Bond are able to make high strength, ductile, leak-proof joints. And they flow so quickly and freely, brazing time is at a minimum.

Because, Phoson and Sil-Bond are produced in *one United Wire* mill from component elements through all production steps including alloying, casting, rolling, wire drawing, coiling straightening *and even*, when required, into preformed shapes to *your* specifications!



Ask for the new Phoson Folder

One central, *responsible* control is your assurance of products to consistent high quality and of prompt delivery promises *maintained*.

For Dependable Low Temperature Brazing You Use The Finest Alloys When You Use PHOSON and SILBOND

Visit us in Booth No. 63 Ninth Exposition of Air Conditioning and Refrigeration Industry.

Wherever you join metals make them

UNITED WIRE
& SUPPLY CORPORATION
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Permanently United

Offices in Principal Cities
SEE YOUR *UNITED* WELDING SUPPLY DISTRIBUTOR

Circle No. 81 on Reader Service Card.

RANITE "BX"

Hardfacing Saves Crusher Mantle from Junk Heap

Illustration shows mantle after final hardsurfacing layer has been applied.

• Back in 1950 the City Rock plant in Sunland, California (now owned and operated by Livingston Rock & Gravel Co.), ran up against a problem.

• The mantle of its primary gyratory crusher had become so badly worn that, unless quickly replaced, a long shutdown was in prospect. Casting a new mantle and shipping it from the East would require at least a month!

• Rebuilding the mantle by welding, however, solved the problem, quickly and economically. Three welders, putting in 120 working hours and using 400 lbs. of RANITE "BX" ¼ in. Hard-Surfacing Rod and 200 lbs. of stainless steel, got the big crusher back into operation in exactly 5 days!

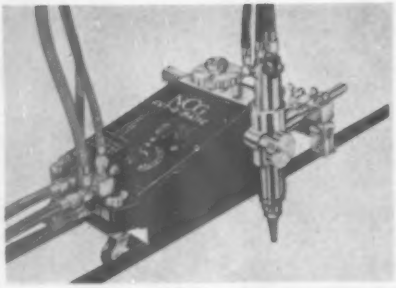
• Ever since, at 2-year-intervals, the mantle has been re-surfaced again with RANITE "BX" to keep the crusher busy at its task of breaking up to 200 tons per hr. of hard river rock at a 4½-in. setting.

• This experience is typical of many in the pit and quarry industries where the proper application of low-cost RANITE Hard-Surfacing Rods is prolonging the life of gyratory, jaw, and roll crushers, bucket teeth, screen plate, etc. Save time, trouble and maintenance expense by contacting your nearest RANITE representative, or write direct to:

RANKIN MANUFACTURING CO.

616 Marengo Ave.
ALHAMBRA 2, CALIFORNIA

Circle No. 82 on Reader Service Card.



Portable Cutting Machine

A new version of the Cut-O-Matic flame cutting machine made by National Cylinder Gas Co. weighs under 30 pounds, including torch—20 pounds less than previous models. New Model No. 7 has three-point suspension system which is said to increase cutting accuracy and improves quality of work.

Other features include a valve block which permits pre-heat adjustments at the machine; a rotary-type switch said to be maintenance-free for life of machine; new three-hose torch with quick-acting valve and individual hose to pre-heat and cutting orifices.

Unit may be purchased with either 110-115 volt AC-DC or 220 volt AC motor, standard or slow speed.

Circle No. 159 on Reader Service Card.

Band Welder

Specifically designed for joining stainless steel and monel face wires and face wire retainer bands, used for retaining face wires on cylindrical filter screens, washers and deckers used in pulp and paper industry, Thomas Band Welder has automatic cycle control which assures uniform welds and eliminates danger of overheating bands.

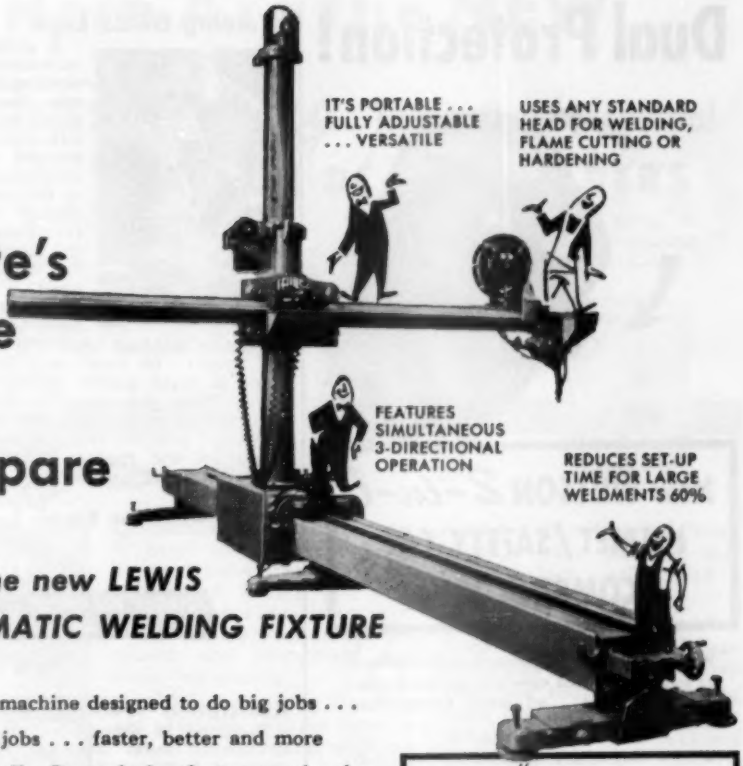
Band Welder joins face wire together and also the six to nine bands required for holding the average face wire in position in less than 60 seconds per band. It eliminates movement of heavy equipment to the job location and permits salvage and re-use of old bands.

Manufactured by Thomas & Middleton Equipment Designers and sold by Kraft Equipment Co., complete unit weighs less than 25 lbs. and operates on any 110 volt, 60 cycle electrical outlet. Mechanism of welder is enclosed in shatterproof fiberglass case which is non-conductor.

Circle No. 160 on Reader Service Card.

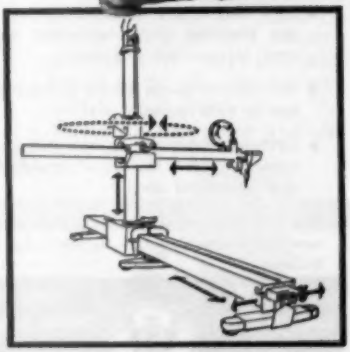
There's none to compare

with the new LEWIS AUTOMATIC WELDING FIXTURE


IT'S PORTABLE . . . FULLY ADJUSTABLE . . . VERSATILE
USES ANY STANDARD HEAD FOR WELDING, FLAME CUTTING OR HARDENING
FEATURES SIMULTANEOUS 3-DIRECTIONAL OPERATION
REDUCES SET-UP TIME FOR LARGE WELDMENTS 60%

Here's a machine designed to do big jobs . . . intricate jobs . . . faster, better and more economically. Its exclusive features make the LEWIS "Universal" the world's most versatile welding fixture. By combining portability with complete flexibility, LEWIS engineers have taken "the curse" out of complicated weldments.

See it . . . try it! There's none to compare in performance or price.



8854-LW

FOR DETAILS AND PRICES, WRITE TODAY . . . OR CALL BEDFORD 2-2500.

LEWIS **THE LEWIS WELDING & ENGINEERING CORP.**

70 Interstate Street • Bedford, Ohio

Circle No. 83 on Reader Service Card.

Dual Protection!

New WILLSON *2-in-1*
HELMET / SAFETY CAP
COMBINATION

Welders who need full protection for the head as well as face and eyes now get extra comfort and safety . . . all ways! Outstanding features include:

- ★ **Both safety cap and helmet are one-piece Fiberglas reinforced plastic—lightweight, moisture proof, heat resistant—and tough!**
- ★ **Well-balanced helmet features push-button fastener for quick removal at will!**
- ★ **Lightweight safety cap available with exclusive patented "geodetic suspension", providing maximum comfort and safety.**

Ask your Willson distributor to show you this new 2-in-1 combination—or write for latest bulletin.

Over 300 safety products carry this famous trademark

WILLSON

Leaders in Research and Development of Safety Equipment Since 1870

WILLSON PRODUCTS, INC.
223 Washington St., Reading, Pa.

Circle No. 84 on Reader Service Card.

Welding Guide Light

A guide light for automatic welding developed by Jimmie Jones Co. is said to eliminate off-center submerged arc welds. Unit projects a spot of light to give operator a definite reference point for the accurate guiding of the welding head.

In use, guide light is rigidly attached to welding head and moves with it. Bright "in line" spot is projected right in weld groove or on a parallel edge. With the spot in sharp focus, light serves as an indicator of the hidden weld position and also indicates the height of the contact jaws above the work, an important factor in weld voltage control.

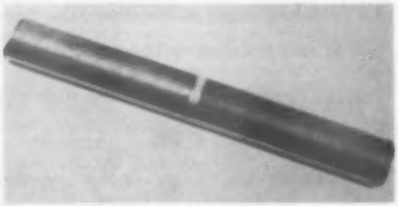
Circle No. 161 on Reader Service Card.

CIRCLE NUMBERS ON THE CARD AND MAIL!

Resistance Welding Tip Shaper

Designed to shape electrode tips and to deburr seam welding wheels with removal from machines, a new file introduced by Copperloy Corp. is of curved design with non-clogging, self-cleaning curved teeth—18 per inch—milled and honed and 10-inches long.

Curved design of the Tip Shaper permits rapid, accurate shaping because tips



are rounded as they are filed. The file is said to be useful in multi-point machines where tips are close together. Seam welding wheels are deburred and shaped by running the curved surface of the file over the edges of the wheel.

Tool can be rehoned after long usage.

Circle No. 162 on Reader Service Card.

Here Are the NEW

MID-STATES *Viking* Heavy Duty Industrial AC and DC ARC WELDERS

Mid-States Viking Inert Gas AC Welder 200-300 rated amps, 230-460 volts.

Mid-States Viking DC Welder 200-thru-400 rated amps, 230-460 volts.

Mid-States Viking AC Welder 200-thru-500 rated amps, 230-460 v.

Select from the Complete MID-STATES Line

Something new and big has been added to the Mid-States Welder line: the New Mid-States Viking AC and DC industrial-duty arc welders . . . proved in performance and recognized for their fine quality.

Mid-States Viking Welders are available in three types to suit every industrial welding purpose:

AC transformer type of 200, 300, 400 and 500 amps rated capacity; DC rectifier type of 200, 300 and 400 amps rated capacity; and the AC inert gas type of 200 and 300 amps rated capacity. The Mid-States Vikings have patented features, unique design and a sturdy construction.

And in the well known Mid-States Welder group of lower amperage units there are sizes ideal for shop use—ranging from 7 to 300 amps capacity. Whatever your arc welding problems may be, light or heavy duty, general or production work, there is a Mid-States to do the job the way you want it done.

Write for literature and details today!

Mid-States 210 AC Welder with No. 10 Missing Link 200 amps, 230 volts.

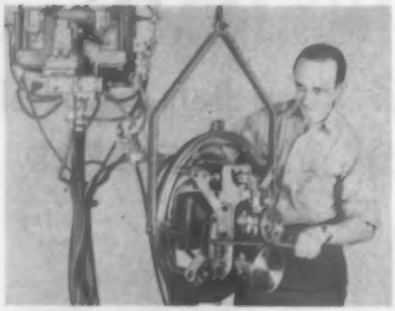
Mid-States 175 Bulldog 180 amps, 230 volts.

Dealers invited—some good territories open—write for details.

Mid-States WELDER MFG. CO.

6027 SOUTH ASHLAND AVENUE • CHICAGO 36, ILL.

Circle No. 85 on Reader Service Card.



Portable Seam Welder

A new portable seam welder designed to weld 200-ipm has been introduced by Progressive Welder Sales Co. Originally developed to weld aircraft drop tanks during World War II, the unit is lighter yet sturdier than previous models, thus reducing operator fatigue.

Extremely flexible, this unit will weld 180° vertical axis and 360° horizontal axis. It is mounted in a low-friction ball bearing ring.

Circle No. 163 on Reader Service Card.

Multi-Purpose Spectacles

Interchangeable lenses, which are snapped into place without tools, permit frame of new Executive Safety Spectacles sold by Watchemoket Optical Co.

to serve more than one purpose. For eye protection from impact, clear lenses are provided. For average sunlight and glare, light green lenses are available; for bright sun and extreme glare, medium green lenses. Gold lenses are available for increased visual acuity. Curved and oversize for extra protection, all lenses are optically perfect, shatterproof Methacrylate.

Circle No. 164 on Reader Service Card.

cut weld cleaning time by 85%

Throw away your cold chisel and whisk off weld spatter with a dry rag! Protect-O-Metal spatter-proofing compounds make weld cleaning a breeze. Improve your welds at the same time . . . P-O-M compounds quiet the arc, improve fusion and electrode operation, prevent oxidation and annealing scale, cause no porosity. No smoke, odors, or fumes.

P-O-M No. 2. Non-inflammable, non-toxic, water-soluble paste. Inorganic. Thin before applying and start welding at once. $3.30 per gallon, f.o.b. Dayton.

P-O-M No. 8. Rust- and corrosion-resistant resin base compound. Comes ready to use. Safe for all metals. Good paint primer; permits outdoor storage of subassemblies. $3.35 per gallon, f.o.b. Dayton.

MONEY-BACK TRIAL OFFER
Order a trial gallon of each today for testing in your shop. We'll cancel the bill if you're not satisfied.

PROTECT-O-METAL

G. W. SMITH & SONS, INC.
5402 KEMP ROAD, DAYTON, O.

Circle No. 86 on Reader Service Card.

Circle No. 88 on Reader Service Card.

Die Life Increased 500%...by ***Hard-Facing***

Dies, used to shape refractory tile, last 5 times longer when hard-faced with HAYNES STELLITE alloy. The hard-faced dies last as long as 10 years—producing up to half a million tiles! The high pressures and abrasion from the dry press operation made it necessary to replace unfaced dies in less than 2 years.

There are 14 HAYNES hard-facing alloys . . . an alloy for every type of wear. Some are hard and abrasion-resistant, some are tough and shock-resistant, and some give top protection against corrosion, erosion, and heat. Use them to increase production capacity and cut maintenance costs.

Your local dealer carries a complete line of HAYNES hard-facing alloys, including: HAYNES iron and nickel-base rods, HAYNES STELLITE cobalt-base rods, and HAYSTELLITE tungsten carbide tube rods. Ask him for literature. If you don't know the location of your local dealer, write to Haynes Stellite Company a Division of Union Carbide and Carbon Corporation; Kokomo, Indiana.

See... **Your local Haynes Stellite Dealer**

or

Write... **to Haynes Stellite Company**

"Haynes," "Haynes Stellite," "Haystellite" are registered trade-marks of Union Carbide and Carbon Corporation.

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Circle No. 88 on Reader Service Card.

power -when and where and
in the EXACT amount you need!
10-190 amp 110-220 v
That's the capsule story of 190-A—one of scores of precision welders—both arc and spot—from the forward looking engineering of BIRDSELL. More power per dollar of investment—more power per handy pound. Invest some time—call your dealer for a demonstration of welders, sensational in concept—unheard of in performance!
BIRDSELL PRODUCTS
PALO ALTO CALIF.
STEPLESS AMPERAGE CONTROL

Constant-Voltage Welders

A new line of constant-voltage welders introduced by Harnischfeger Corp. is said to make welding more efficient, while producing better welds. Job tested on a variety of automatic welding processes, units are available in 500, 750 and 1200 amp capacities.

Welders are said to allow operators to select arc voltage desired. This voltage then remains constant during entire welding cycle. Operator only has to set correct rod feed and travel to get desired deposit rate.

Weld quality is said to be enhanced because starting and recovery are instantaneous even where tack welds and areas of poor fit-up are encountered.

Company claims welders achieve an efficiency of 85 percent or better. On field welding jobs where power must be supplied by engine-driven generators, it is reported these welders often double welding capacity from the same power source.

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Industry's Fastest Selling
CYLINDER TRUCKS

LT-300

Many Styles For all Sizes of Cylinders

Write for full Information

KC-80

Welded Truck & Specialty Co.
1300 DIVERSEY PKWY • CHICAGO 14, ILLINOIS
SOLD ONLY THRU "INDEPENDENT DEALERS"

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MODERN ENGINEERING COMPANY
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C. E. L. KERCHNER WELDING & EQUIPMENT SUPPLY CO.
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Birmingham, Ala.
2901 Jackson Hwy.
Sheffield, Ala.

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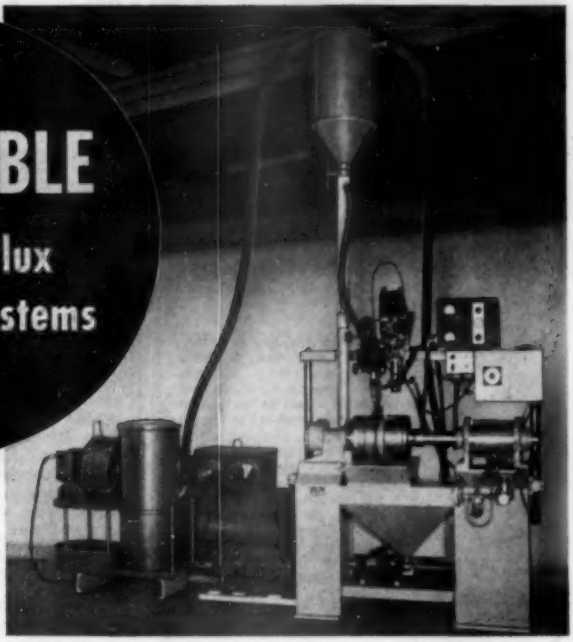
Circle No. 94 on Reader Service Card.

INVINCIBLE

Welding Flux Recovery Systems



This compact set-up includes a primary separator tank and an Invincible Model 460 unit.

Pay for themselves . . . with interest!

If you do submerged arc welding, consider these benefits:

1. Invincibles save valuable flux by recovering **all** unfused flux from the work, removing slag or fused particles, and returning the unfused flux to the hopper of the welder. Both manual and continuous flow systems are available.

2. Invincibles save costly man-hours because they are more efficient than manual methods.

3. Invincibles also save money by removing all fine dust (flux flour), thus speeding production and reducing welding rejects.

These Invincible advantages can be applied to your job, regardless of its size. Let us send you our **Free Folder** on Flux Recovery.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

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Plates

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For welding Manganese Steel Castings

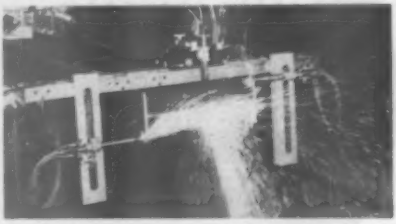
In Timang Welding Rod spattering and slag formation are reduced to a minimum. Welds acquire hardness and toughness equal to the parent manganese steel under impact and abrasion. The rod is furnished in standard sizes, coated and bare. Timang Repair shapes, also, duplicate the wear-resistance of the original material, providing the same economy and service life. Order from your welding supply house or from Taylor-Wharton direct.

Send for Bulletin No. 451.

TAYLOR-WHARTON IRON & STEEL COMPANY
(Division of Harrisburg Steel Corporation)
High Bridge 8, New Jersey
Cincinnati, O.; Birmingham, Ala.; Easton, Pa.

"Flame Saw"

A new type of "Flame Saw" for cutting heavy steel structurals has been developed by K-G Equipment Co., Inc. According to the manufacturer, unit is hand-portable and can be set up anywhere in plant or on the job. It requires



only 110 volt power supply and a set-up of oxygen and fuel gas. Work itself is table—it is only necessary to slide Flame Saw to position, set torches to proper distance, light master manifold-controlled torches and start cutting.

Addition of extra length of track and radius rod makes saw adaptable to any straight line or circle cutting job.

Circle No. 167 on Reader Service Card.

Resistance Welding Control

A new synchronous electronic control designed for single phase welding of aircraft components has been introduced by Square D Co. The controller consists of separately removable (plug-in) panels for all control functions. One panel performs the sequence-weld function, another the up and down slope control, with the remaining tow units handling

Airsan Welder Filters

STOP COSTLY DUST HERE!

PERMANENT CLEANABLE

WESTINGHOUSE
HOBART
LINCOLN
P&H
WILSON
GENERAL ELECTRIC

Airsan Welder Filters

Eliminate Dust to Maintain • Cooler Motors • Constant Arc • Longer Brush and Rotor Life • Greater Welder Efficiency • Constant Welder Operation • No Shut-downs • No blowing out of welders

Air Filter Corporation
166 North Water St., Milwaukee 2, Wis.

Circle No. 95 on Reader Service Card.

forge delay and chill-temper functions.

Sequence weld-timer includes heat control and may be provided with or without a pulsation sequence. Weld and weld interval timers are calibrated for the very long times necessary for aircraft aluminum welding.

Circle No. 168 on Reader Service Card.

Heavy Duty Spot Welder

Recently introduced by Delta Welder Corp., is a new heavy duty spot welder designed for high duty cycle resistance welding on medium gauge sheet metals. Welder has a fabricated steel frame of formed boiler plate. Upper head construction is said to offer a hardened and ground, lubricated slide riding in adjustable "V" gibs.

Welder has an air cylinder of sufficient capacity to handle a wide range of metal thicknesses. Lower arm is described as being completely adjustable in a vertical direction from 13-inches between the arms in a closed position to 23-inches in an open position. Lower arm is also readily adjustable in a horizontal plane from standard throat depth of 18-inches to within 9-inches of machine face.

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INDUSTRY and WELDING
Visit With Us At The
Metal Show
Booth 954

Circle No. 96 on Reader Service Card.

GLENN COMPANY — CONSTANT VOLTAGE *News Notes*

CV Welding Speeds Water Heater Production

Four major U.S. water heater manufacturers now use GLENN CV automatic welders. Why? Because GLENN CV makes automatic welding *truly* automatic. Arc voltage stays constant – no voltage or feed control problems. Current can be increased for faster welding with fewer rejects. The result is far higher production at much lower cost.

GLENN CV welders are job-proved for submerged arc, inert gas, CO-2, "squirt" and automatic hard facing and stud welding processes. 3 models—500, 750 and 1200 amp. continuous duty rating, 18-42 v. arc voltage range. Operate from 3-phase a.c., deliver d.c. welding current at 85%-plus efficiency, 90% or better power factor. Write or wire for literature, application data, prices. 4

GLENN COMPANY
CONSTANT VOLTAGE PIONEERS
3134 E. 10TH STREET
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10228 80. AVE. N.
CHICAGO 17, ILL.

made expressly for this issue...as a get-acquainted offer–

THE *Welder* ONE-FIFTY

- 13½" glove, gauntlet type
- lined palm and back
- thumb seam reinforced for extra wear
- seamless index finger
- cowhide selected leather, all in-seam construction
- extra welting at second middle finger
- SARAN wrapped for extra cleanliness

Get the WELDER ONE-FIFTY at your local dealer or place your order thru him by writing

SAFETY CLOTHING & EQUIPMENT CO., 1990 East 69th St., Cleveland 3, Ohio
Manufacturers and Designers of a complete line of Welding Clothing
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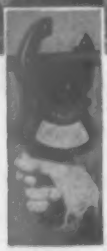
Check Your Amperage



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USE THE
TONG TEST
AC-DC
AMMETER

Machine settings alone cannot control welding quality! Measure actual welding current instantly, accurately and safely by simply clamping a Tong Test Ammeter around the electrode cable. Only Columbia Tong Test measures both AC and DC. Interchangeable ranges available up to 1000 amperes.

Prevent costly defects—increase welding production.

Get the facts today! Write for 8-Page Catalog IW-400

COLUMBIA

0154-CE

COLUMBIA ELECTRIC MFG. CO.
4545 Hamilton Avenue • Cleveland 14, Ohio

NEWS

from Page 14

Anaconda Opens Aluminum Plant

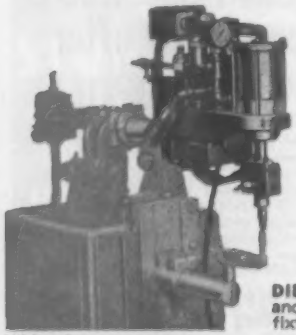
A $65,000,000 primary aluminum plant of Anaconda Aluminum Co. was formally opened at recent ceremonies. Russell B. Caples, president, said new facilities would reach planned capacity rate of 120 million pounds annually by January 1, 1956. The company is the first to enter the aluminum field in this country since 1946.

Plant is located at Columbia Falls, Mont.

Barnett Promoted at Armour Research

Orville T. Barnett has been promoted to assistant manager of metals research department at Armour Research Foundation of Illinois Institute of Technology, Chicago. In his new position, Barnett's chief responsibility will be to help develop projects for new areas of research.

A 1933 graduate of Illinois Tech, Barnett joined the Foundation in



Write for our current available Welder List

Solve Your Welding Problems at HOFFMAN-CHICAGO

Spot, Butt, Seam, Gun, Flash, Projection, Multi-Point and Stud Welders

NEW • USED • REBUILT

← WELD-AIR-MATIC
Spot welder air conversion unit. Tests prove 10,000 welds hourly on continuous daily schedules.

BUTT-ON-SPOT →
Automatic butt welding attachment. Water - cooled, fits any spot welder with minimum horn clearance of 7".

DIES: complete facilities to design and build special welding dies and fixtures for your piece parts.

ACCESSORIES: complete stock of Welder Controls, Holders, Tips, and Bar Stock.

ROBT. W. HOFFMAN CO., INC. 38 South Clinton Street, Chicago 6, Illinois

Circle No. 98 on Reader Service Card.

April, 1954, as supervisor of welding research in the metals research department. He has a wide background in metallurgy and welding and in welding sales. A member of the American Welding Society and A.S.M., Barnett has written more than 100 articles for publication in metallurgy and welding fields.

W. H. Thomas Named to Government Post

Appointment of William H. Thomas, of Allentown, Pa., manager of government sales for Air Products, Inc., as Director of the General Industrial Equipment Division, Business and Defense Services Administration, has been announced by the Department of Commerce.

Tube Turns Appointment

W. C. (Bill) Robinson has been appointed an assistant sales manager of Tube Turns, Louisville, Ky., according to John G. Seiler, executive vice president and general manager of Tube Turns, a division of National Cylinder Gas Co., Chicago.

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Remove Weld Scale...
Weld Spatter Faster
with this
6 INCH 50 OUNCE
BIG BULLY
AIR HAMMER
Fits securely into operator's hand. By varying finger pressure on the exclusive metering trigger you can produce from 0 to 9000 blows per minute. Consumes 6.5 C.F.M. of air at 150 p.s.i. working pressure.
SEVENTEEN TOOLS AVAILABLE FOR 100 DIFFERENT JOBS
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IT WELDS LIKE A CHARM

*TWECO-LITE, the new flexible ALUMINUM welding cable that weighs half as much, lasts longer, and costs less

a product of TWECO PRODUCTS CO. Wichita 1, Kansas

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DO YOU KNOW WHY

YOUR SUBSCRIPTION TO THIS

MAGAZINE IS PAID FOR YOU?

INDUSTRY & WELDING readers—more than 35,000—are carefully selected, "hand-picked" by progressive welding supply distributors, because they are 100% interested in welding.

INDUSTRY & WELDING is sent *only* to qualified readers. INDUSTRY & WELDING goes to users whose specifying and or buying responsibilities are guaranteed by local welding supply dealers.

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INDUSTRY & WELDING

1240 ONTARIO STREET CLEVELAND 13, OHIO

Alloy Fabricators Consolidate Offices

Alloy Fabricators Div., Continental Copper & Steel Industries, Inc., has announced consolidation of its sales, estimating and engineering office with that of the Walsh Holyhoke Division. Combined functions are now centralized at the Company's Executive Offices at 345 Madison Ave., New York.

Purchasing, planning and production remain at Perth Amboy, N.J., plant.

Copper Furnace Brazing Approved at Superweld

Superweld Corp., No. Hollywood, Calif., has been reapproved as a source for copper furnace brazing by the Los Angeles Air Procurement District, in accordance with Specification MIL-B-7883, it was announced by Robert Jones, president. Company is known for its copper furnace brazing process which permanently joins two or more ferrous metal parts under high temperature in an electric furnace.

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Choose Huntsman angle-shape for

- reduced glare from behind
- better top-of-head protection
- easy fit in your toolbox
- scientific upward ventilation
- longer helmet life

Specify the complete line of quality-built, guaranteed products

HUNTSMAN "face savers"

WELDING HELMETS, FACE SHIELDS & ACCESSORIES

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S-M-S CORPORATION

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8 STEPS TO BETTER WELDING

ELECTRODE DRESSERS
EJECTOR TYPE HOLDERS
ADJUST-A-ANGLE ADAPTERS
ADJUST-A-PRESSURE HOLDERS
SPECIAL ELECTRODES & DIES
WELDING WHEELS & ELECTRODES
ADJUST-A-COLD ELECTRODE HOLDERS
FORGINGS & CASTINGS IN SPECIAL ALLOYS

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REEVES

FIRE-CHIEF

Treated Welding Curtains

CONFINE YOUR DANGER

A close woven canvas, weighing 10 ounces per square yard before treatment, impregnated with Hooper's Fire Chief treatment under their patent which carries the Underwriters Laboratory seal.

"IF IT'S MADE OF CANVAS, WE MAKE IT"

A. SMITH & SON, INC.

GREEN & RIDGE AVE. • PHILADELPHIA 23, PA.

King-Size Power Unit

Approximately $45 per day fuel savings can be obtained by use of the welding unit shown, rather than individual gasoline engine-driven welders. Unit consists of one Caterpillar D13000 engine connected to a jack shaft, which powers eight 400 amp welders by means of V-belt drives. Attached to end of jack shaft with a clutch is a 182 cfm air compressor. Power is steady and it is impossible for operators to tell by means of their arc when air compressor comes on and off.

Photo courtesy of Lincoln Electric Co.

Thor Branch Managers

Appointment of new managers

AMERICA'S BIGGEST ARC-WELDER VALUES

Model 125A
110/220
125 Amps.
$98.50
Complete
Accessories
F.O.B. Factory

Sell the Trindl Industrial line at prices far below smaller, less efficient welders.

FEATURE THE TRINDL—MODEL 125A combination 110V.-220V. machine. Welds metals to ½", with 16 heat stages from 20 to 125 amps.

Fully guaranteed for 1 year on continuous operation. It is easy to operate. Its rugged construction and portability make it the ideal welder for auto and truck shops, factory and building maintenance and repairs, machine shops, metal fabricators, plumbing and heating contractors and farm repairs. Trindl welders are available in 8 models from 80 amps. to 400 amps., priced from $56.50 to $370.00. Attractive trade discounts.

DISTRIBUTORS AND JOBBERS INQUIRIES INVITED.
WRITE DEPT. T-34-K FOR COMPLETE FACTS AND FIGURES.

Trindl
IRON FIREMAN ARC WELDERS

TRINDL PRODUCTS, LTD.
1807-11 S. Clark St.
Dept. T-34-J
CHICAGO 16, ILLINOIS

Circle No. 101 on Reader Service Card.

in two Thor sales and service branches have been announced by J. A. Hill, vice president and sales manager at Thor Power Tool Co. Clarence B. Bergen has been named branch manager at Milwaukee. He is succeeded as Cleveland manager by Robert J. Grace, formerly service engineer in the Indiana territory of the Chicago Branch.

Worthington Boosts Bartlett

Roland W. Bartlett, sales engineer, has been promoted to Manager of Worthington Corporation's Detroit office, according to a release by W. A. Meiter, general sales manager. Formerly with the company's Washington, D. C. office, Bartlett joined Worthington in 1940.

R. W. Barlett

Circle No. 104 on Reader Service Card.

NOW... for WELDERS...
ANOTHER DE-STA-CO FIRST...
3 New Portable Clamps with
TRIGGER-RELEASE

MODEL 484

Instant easy action enables operator to clamp and release the tool with one hand . . . Clamping Pressures up to 1200 lbs. . . . Especially Rugged Construction for extremely long wear!

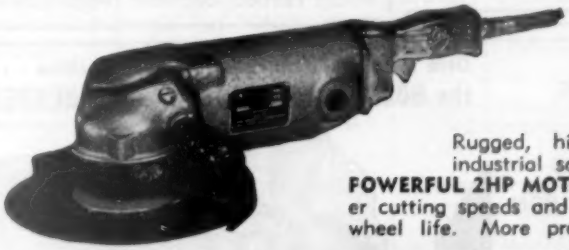
Two Other Models...

MODEL 482

MODEL 486

Write for FREE BULLETIN 482-4-6

DE-STA-CO DETROIT STAMPING COMPANY
World's FIRST Line of TOGGLE CLAMPS
324 Midland Ave. • Detroit 3, Michigan



Nedco
MODEL "E"
SANDBRUTE

Rugged, high speed 9-inch industrial sander and grinder. FOWERFUL 2HP MOTOR maintains faster cutting speeds and increases grinding wheel life. More profit for the shop.

Write today for new 4-page bulletin that describes complete line of Nedco grinders, sanders and polishers. Operating specifications and price data are given.

THE Nedco COMPANY
88 Rumford Ave. • Waltham 54, Mass

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Circle No. 106 on Reader Service Card.

MEETS EVERY STANDARD ACROSS THE WORLD!

The leader for over forty years. Quality in any quantity.

SHAWINIGAN
PRODUCTS CORPORATION
EMPIRE STATE BLDG. • NEW YORK 1, N.Y.

Ronca Named Chairman of Technical Committee

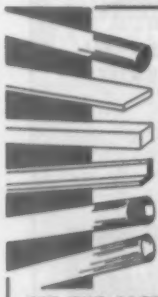
F. Paul Ronca of the Silicon Carbide Product Engineering Department of Carborundum Co. was elected chairman of the Technical Committee of the Abrasive Grain Association. Function of the committee is to set up and standardize grain size and related technical specifications having to do with manufacture of abrasive grains.

Champion Employee Retires After 56 Years

Champion Rivet Co. has announced resignation of Miss Mazy C. Mullarky after 56 years of service. Miss Mullarky was employed as secretary to the late David J. Champion, who founded the company in 1895. She continued in that capacity under the current president, T. Pierre Champion.

Guarantee Titanium with Low Carbon Content

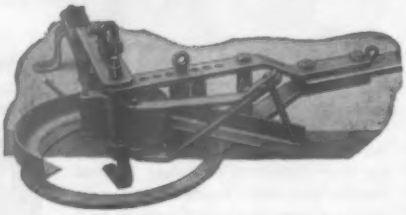
Mallory-Sharon Titanium Corp., has announced that its titanium and titanium alloy mill production will meet a new 0.1 per cent maximum carbon content requirement.



GET THE FACTS! Write for bulletin showing bender models, standard and special dies, and illustrations of bar, angle iron and pipe bends.

HOSSFELD MFG. CO.
438 W. 3rd Street • Winona, Minn.

ONE man bends all these on ONE machine . . .
the HOSSFELD UNIVERSAL® IRON BENDER



Wrenchless, the Hossfeld Bender is always ready for use. It's easily and quickly set up for the 101 different bends needed every day in maintenance and production work. Adaptable, it replaces special bending equipment. For those hard-to-pull bends on heavier material, a Hydraulic Attachment (optional) enables one man to do the job.

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Here's a *new* book YOU should have

New Revised Edition of The Pocket Manual of Arc Welding

Valuable Data — the new Pocket Manual of Arc Welding contains latest welding application data of value to foremen, supervisors, inspectors and operators—in concise, easy-to-read form.

You'll use it Every Day — in your shop work. The new Pocket Manual of Arc Welding provides practical on-the-spot information on many arc welding problems. Written from the standpoint of welding supervisors and operators, it fills a longtime need in the industry.

Order Your Copies Now— Immediately available at $1.00 each. Special discounts for larger quantities. If your welding supply distributor cannot supply you, use the coupon below.

172 Interesting Pages

Written by **Lew Gilbert**, editor of INDUSTRY and WELDING this "down-to-earth" Pocket Manual can be used as a welding department guide as well as a text book for operator training programs. It contains a large variety of new reference data in the form of charts, diagrams, welding symbols, efficient joint details, etc.

The Industrial Publishing Group
1240 Ontario St.
Cleveland 13, Ohio

Please send me.....copies of the (POCKET MANUAL OF ARC WELDING) at $1.00 each. Check or money-order in the amount of $..... is attached.

Name .....

Address .....

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Sacrifice Sale!

ROYAL SOLDERING PASTE

LARGE ½ LB. CANS
PACKED 100 CANS PER CASE
REGULAR VALUE $45.00
DISCOUNTS FOR QUANTITY ORDERS

ACORN IRON & SUPPLY CO.
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SAVE GAS with a
"SAFETY" SURE-FIRE TORCH IGNITOR

ORIGINATOR OF FRICTION GAS LIGHTERS IN AMERICA

SAFETY GAS LIGHTER CO.
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FLUXINE

FLUXES For Welding
Brazing
Silver and Soft Soldering
Every
METAL and ALLOY
Write for latest Fluxine Bulletin

KREMBS & COMPANY
669 W. Ohio St. • Chicago 10, Ill.

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Welding Head Manipulator Converts Open Field Into Efficient Weld Shop

Walsh Holyoke Fabricators Division of Continental Copper and Steel Industries, Inc., convert an open field into an efficient weld shop through use of Pandjiris' RBM type welding head manipulators. Job site is Littleton Dam,

Littleton, N.H. The job called for automatic submerged-arc welding of approximately 3,500 feet of girth seams on penstock joints ranging from 16½ feet to 19½ feet in diameter, with steel plate thickness ranging from ⅝-inch to 15/16-inch.

Welding speed averaged 20 inches per minute, and all welds were required to pass a 100% X-Ray inspection for quality. The operation consisted of two-pass welding — one pass inside and one outside.

The RBM manipulator is a self-contained unit consisting of a variable speed pedestal car, rotating trunnion, column, saddle and variable-speed-drive welding boom with end mounted automatic welding head. The machine is entirely remote controlled from the operator's pulpit by a push button station panel board.

Circle No. 114 on Reader Service Card.

OPPORTUNITIES

Rates: $25 per column inch. $10 per column inch for "Position Wanted" ads. Payment must accompany order.

HELP WANTED SALESMEN

Welding Supply Salesman who have or can build following among Welding Dealers and Heavy Equipment Dealers. Protected Territory. High commission basis. In reply state qualifications, experience, territory interested in. Write Box. 10155, INDUSTRY & WELDING Magazine, 1240 Ontario St., Cleveland 13, Ohio.

R.W.M.A. Reports

As of July 31st, new orders for resistance welding machines and equipment received in 1955 by members of Resistance Welder Manufacturers' Association were 37 percent ahead of orders for the first seven months of 1954. Shipments for the same period in 1955 were 23 percent ahead of 1954.

'Red Head'
WELDING CLAMPS
No Threads to Damage
DESIGNED for WELDING
• Threads never exposed
• Solid plate body

CHICAGO BOILER COMPANY
1971 CLYBOURN, CHICAGO 14, ILL.

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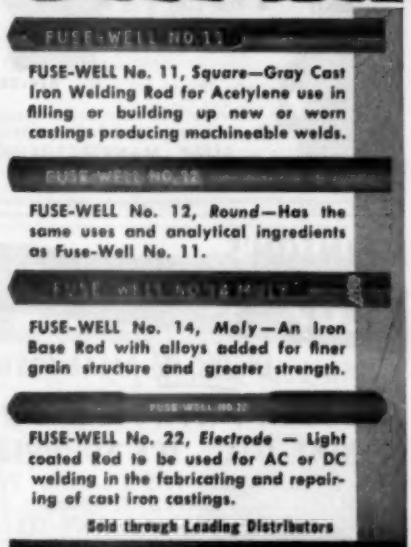
Circle No. 111 on Reader Service Card.
WHEN YOU WELD CAST IRON SELECT THE CORRECT
Fuse-Well
CAST IRON WELDING RODS OR ELECTRODES

FUSE-WELL No. 11, Square—Gray Cast Iron Welding Rod for Acetylene use in filling or building up new or worn castings producing machineable welds.
FUSE-WELL No. 12, Round—Has the same uses and analytical ingredients as Fuse-Well No. 11.
FUSE-WELL No. 14, Moly—An Iron Base Rod with alloys added for finer grain structure and greater strength.
FUSE-WELL No. 22, Electrode — Light coated Rod to be used for AC or DC welding in the fabricating and repairing of cast iron castings.
Sold through Leading Distributors
THE CHICAGO HARDWARE FOUNDRY CO.
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Whittaker Advances 3 Executives

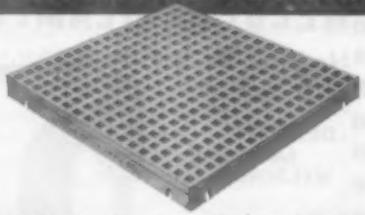
Three executives of Whittaker, Clark & Daniels, Inc. have been advanced according to a recent announcement. Wallace W. Roff, formerly Vice President and Sales

ROFF (Left)

SEIDLER (Lower left)

SMITH (Below)

BENDING BLOCKS or WELDING PLATENS



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Manager, becomes Executive Vice President and continues to serve as a Director.

John Seidler, formerly Assistant Secretary and Assistant Sales Manager, continues as the former, but becomes General Sales Manager. Robert G. Smith, formerly Plant Manager and Regional Division Manager, succeeds Seidler as Assistant Sales Manager and becomes a member of the Board.

Victor Acquires Additional Property

L. W. Stettner, president, has announced purchase of property at 840 Folsom St., San Francisco, by Victor Equipment Co. This property has been occupied by Victor for several years. Major remodeling work has begun and will give the company new, modern offices and additional manufacturing space.

For Valuable Reference Material Available At No Charge
See Page 32

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with the New
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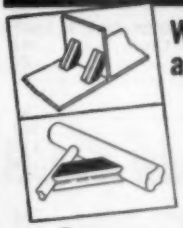

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THE DURO-Lite

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Wins by a technical knock-out. Proven DURO-bility. Used all day — every day with long, trouble-free life. Write for folder.

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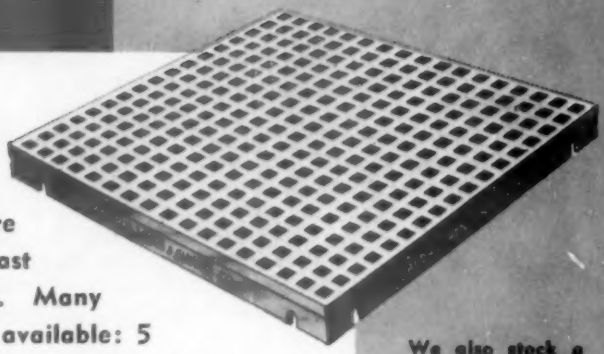

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